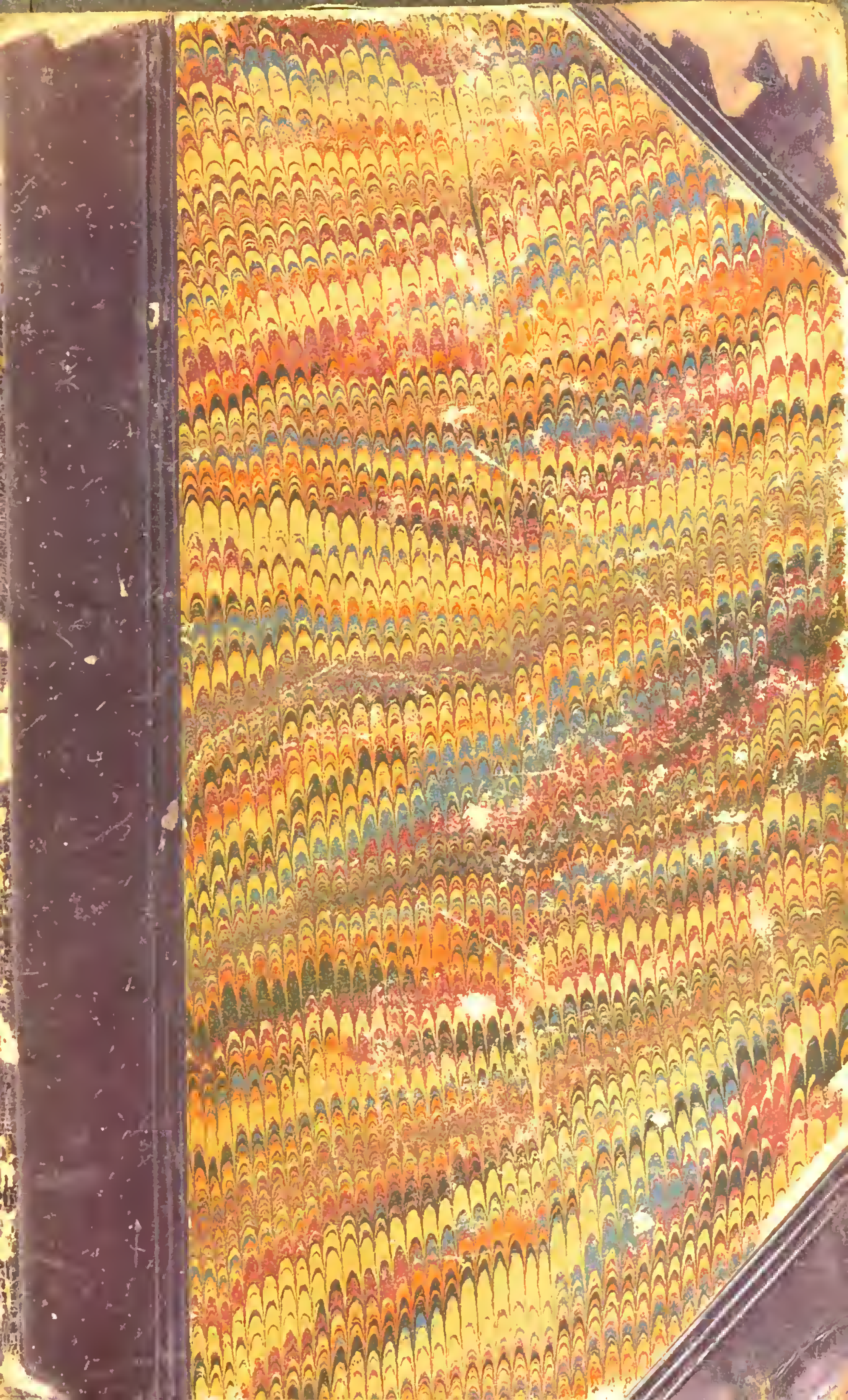

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THE

SURGEON'S VADE MECUM.

BY

ROBERT DRUITT,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS.

> "Id potissimum agens, ut omissis hypothesibus, in praxi nihil adstruat quod multiplici experientia non sit roboratum."
>
> ACT. ERUD. LIPS., 1722.

FIFTH EDITION, MUCH IMPROVED,

AND ILLUSTRATED WITH

ONE HUNDRED AND SEVENTY-FIVE HIGHLY FINISHED WOOD ENGRAVINGS.

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TO

CHARLES MAYO, ESQ.,

SENIOR SURGEON TO THE WINCHESTER HOSPITAL,

IN ADMIRATION OF HIS SOUND JUDGMENT AND SKILL
IN SURGERY,

AND

IN GRATEFUL ACKNOWLEDGMENT OF EARLY KINDNESS,

THIS WORK

IS DEDICATED BY HIS AFFECTIONATE NEPHEW

AND OBEDIENT SERVANT,

ROBERT DRUITT.

39 A, CURZON STREET, MAY FAIR, LONDON,
1st November, 1850.

25

PREFACE.

In bringing before my professional brethren a fifth edition of the present work, my first impulse is to express my thanks for the very favourable reception which this humble contribution to Surgical Literature has everywhere met with. This has made me doubly anxious that the present should not fall short of the preceding editions in utility.

I have endeavoured to make this edition more complete and more practical, and to incorporate with it the various improvements which surgery has received during the last three years, but without adding materially to its bulk; thus avoiding the common vice of books which pass through many editions, and which are apt to increase to an inconvenient size by the addition of new materials to the old.

I have adhered to the original plan of the work, which is simple enough, and enables the various contents to be arranged in an intelligible order, so that the reader can readily find any part which he wishes to consult.

The first Part is devoted to those affections of the entire constitution which may be induced by disease or injury of any part; and which being common to the other subjects of the book, ought necessarily to be treated of first.

In the second Part, the various elementary forms of local disease, that is to say the various changes which disease may effect in the structure of any part of the body, are passed in review; beginning with congenital malformation, and the simpler errors of nutrition, and going on to that series of changes commonly called inflammatory, and to ulceration, gangrene, tubercle and carcinoma.

In the third Part, all the varieties of injury are described: cuts, bruises, stabs, gun-shot wounds, burns, scalds, frostbites, and the effects of the poisons which are generated in animal bodies by disease.

In the fourth Part, all the various tissues, structures, organs and regions of the body, beginning with cellular tissue and skin, then muscle, bone, the blood-vessels, the head, eye, neck, &c., are considered in order, with such of their injuries and diseases as are assigned to the care of the surgeon.

The last Part contains a description of such of the operations as are not included in the other parts.

The Appendix contains a large number of Prescriptions available for almost every form of disease, internal or external, and arranged according to the classes of medicines which they relate to. I have added considerably to their number in this edition, as I am informed that they have proved of considerable utility to junior practitioners.

Of the woodcuts which illustrate these pages, about one half are the work of the Messrs. BAGG; and the remainder of my friend Dr. WESTMACOTT. The Table annexed will show to which of these gentlemen each is to be attributed, and will also indicate the source whence it was copied. I may observe that with very few exceptions, these drawings are not mere diagrams, invented in the artist's studio, nor yet copies from any other published work, but are faithful and original representations of some fact or object in nature. About twenty new engravings are added to this edition, besides that several of the old ones have been drawn afresh, and rendered more correct.

The numerous references at the foot of almost every page will show my anxiety to acknowledge every source of information I have made use of. They will also show the reader, who desires fuller information on any subject, than my necessarily condensed pages can give him, where he can seek it at the fountain head.

I must, in conclusion, express my most sincere thanks to the numerous friends who have assisted me in my labours. To Mr. PARTRIDGE, Mr. FERGUSSON, and their colleagues the Medical Professors of King's College, and Medical Officers of the King's College Hospital, I am under deep obligations, for the privilege of witnessing their practice at the Hospital, and for the permission to have drawings made from some of the preparations in the College Museum. Mr. FERGUSSON I have particularly to thank for allowing me to make use of more than one drawing, which I believe he intends publishing in the next edition of his very able work on Practical Surgery.

The chapter on the eye will show how greatly I am indebted to Mr. HAYNES WALTON; and throughout the work I have frequently availed myself of the friendly suggestions and assistance of Mr. HENRY SMITH.

R. D.

39 A, CURZON STREET, MAY FAIR, LONDON,
1st November, 1850.

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THE

SURGEON'S VADE MECUM.

PART I.

OF THE CONSTITUTIONAL EFFECTS OF LOCAL INJURY AND DISEASE.

CHAPTER I.

OF PROSTRATION, OR COLLAPSE.*

DEFINITION.—As the most proper commencement of a systematic treatise on Surgery, we shall begin by describing a state commonly known as *prostration*, or *collapse*, or *shock to the nervous system;* by which terms we signify that general depression of the powers and actions of life, which immediately follows any severe injury.

SYMPTOMS.—The usual symptoms are, that the patient lies cold, and half-unconscious ; with a feeble pulse and imperfect sighing respiration. But these symptoms are liable to great variety ; for they may not only differ in severity in different cases, but likewise in the relative degree in which the principal bodily functions are disordered. Thus, sometimes depression of the vascular system predominates, and the patient lies in a state of perfect syncope, with the pulse and respiration imperceptible. Sometimes the nervous system is chiefly affected, the patient being bewildered and incoherent, as though intoxicated ; or even comatose, as though he had taken a narcotic poison. Nausea and vomiting ; hiccup ; suppression of urine ; and in children, convulsions, are also very frequent symptoms.

The *duration* of these symptoms is also extremely various. Sometimes they pass off very quickly; but they may remain even for forty-eight hours before reaction is thoroughly established.

TERMINATIONS.—The process of recovery from collapse is commonly called *reaction ;* and the manner in which the case may terminate must depend on the nature and degree of that reaction. Thus,

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* The principal authorities to be consulted on the subjects of the first and second chapters, are Travers on Constitutional Irritation, third edition, and Hunter on the Blood, chap. ii.

First, if it is healthy and moderate, and especially if the collapse arise merely from *concussion* (or violent shaking) of an organ, without actual injury to its structure, it will lead to complete recovery. Thus it very often happens that a slight blow on the testicle or stomach causes an extreme degree of sickness and faintness, which, however, pass off gradually, and leave no ill consequences.

Secondly. If reaction be excessive, the state of collapse will be gradually succeeded by *fever*, symptomatic of the inflammation to which the local injury has given origin.

Thirdly. If reaction be imperfectly developed, it will be converted into the state of *prostration with excitement*, of which we shall speak in the next chapter.

Fourthly. If reaction be altogether wanting, the collapse will terminate in *death.* And death may occur immediately on the receipt of the injury, if it be of extreme severity; or otherwise the patient may die more slowly, the pulse at the wrist becoming fainter, and finally ceasing; and the respiration more and more slow and oppressed, till life is gradually extinguished.*

CAUSES.—These symptoms may be caused by every variety of injury to which the body is liable. Great and sudden extremes of grief, or joy, or fear, or cold;—large doses of any active poison, such as arsenic, or sulphuric acid, or tobacco;—the sudden impression of miasmata, or of morbid poisons, as the plague;—great loss of blood, and mechanical injuries. It is most important that the surgeon should know what injuries are most likely to be followed by fatal collapse, in order that he may have proper materials for giving his prognosis. They are:—

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* VARIOUS MODES OF DYING. — The order, and the manner, in which the various phenomena of life are extinguished vary extremely in different cases, so that we may enumerate several *modes of dying.*

The first is *death by syncope*, or *by anæmia;*—that is, from profuse loss of blood, as after severe wounds, bursting of aneurisms, &c. The symptoms observable are cold skin, weak fluttering pulse, gasping respiration, and convulsions. In this mode, death occurs because there is not a sufficiency of blood for the heart to propel, and so the respiratory and nervous functions cease in consequence. After death the heart is found contracted.

The second is death *by asthenia.*—This is caused by circumstances producing a depressing effect on the system, either sudden and violent, or prolonged. The heart ceases to act, not from want of blood, as in the preceding mode, but from want of power to propel its contents; and therefore after death it is found full and distended, the left cavities with red blood. Sudden death from shocks to the nervous system; and gradual death from nervous exhaustion, from severe pain, and from tetanus and hydrophobia, are instances of death by asthenia. When this form of death occurs gradually (as in inflammation of the bowels), the pulse is very frequent and feeble, but the intellect perfect, and senses acute to the last.

The third is *death by apnœa*, or from interruption to respiration.—(Dr. Watson has judiciously substituted the term *apnœa*, for *asphyxia*, which is generally used to denote this kind of death, although incorrectly, since *asphyxia* literally signifies *want of pulse.*) Familiar instances of this mode are afforded by the various forms of suffocation, drowning, violent inflammation of the lungs; injury to the spinal cord in the cervical region, &c. The immediate effects of the privation of air, are, a stagnation of blood in the lungs, the circulation of venous

First, those of organs that are necessary to life, as the stomach and brain; and it is well known that a severe concussion of either of these organs may extinguish life instantaneously.

Secondly. Injuries of organs which do not easily admit of reparation ; as the joints.

Thirdly. Injuries that are severe in their nature; as punctured, lacerated, contused, and especially gunshot, wounds.

Fourthly. Injuries of great extent, especially of the skin, although they may be trivial in degree;—as extensive burns ; or injuries that cause very great *pain*. Severe pain, by itself, is capable of exhausting the vital powers.

Lastly. Injuries occurring to young infants, or to the very aged; or to constitutions that are enfeebled by excess and intemperance,* or by long-standing bodily disease, or mental depression. From this it will be learned that the slightest injury or surgical operation may prove fatal to persons who labour under chronic organic disease, such as tubercles in the liver or lungs, or disease of the kidneys ; or who have been harassed by continued anxiety and despondency of mind ; so that in almost any case a firm persuasion that recovery is impossible is almost sufficient to render it so.

TREATMENT.—The indication is, to excite the vital organs to a moderate and healthy reaction. The remedies are, stimulants, of which hot brandy and water is the best ;—nourishment, such as beef-tea ; —and warmth, by means of blankets, and of heated bricks, or bottles of hot water put under the axillæ or between the thighs.—*Vomiting* may be allayed by a large dose of solid opium (gr. ii.) ; or by an opiate enema (vide Formula 101) sometimes by a turpentine

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blood to the brain and body, and consequent impairment of their functions. After death, the *right* side of the heart is found *full* of black blood, which it has been unable to propel through the densely congested lungs ; the *left* side partially full of black blood. When this mode of death is slow, as in croup, &c., the phenomena are, great dyspnœa, with lividity of the countenance, and delirium arising from the circulation of venous blood in the head.

The fourth is *death by coma*.—This is what occurs from such compression of the brain as tells upon the medulla oblongata, and from poisoning by opium, and in other cases in which the functions of the brain are suspended. In these cases the immediate manner of dying is the same as in the last mode (viz. by *apnœa*), but, whereas in the latter it is caused by interruption to the access of air to the lungs, in these cases it arises from want of action in the respiratory muscles, which cease to receive the impulse to action, when the functions of the nervous system are destroyed. In cases of coma produced by ardent spirits, opium, and some other poisons, life may often be preserved if the respiration be kept up artificially, so as to keep the lungs and heart at work and the blood aërated, till the stupefying effects of the poison have passed off.

It must be observed, in conclusion, that although pure and well marked instances of each form of death are often met with, yet that two or more are very frequently combined. Thus in phthisis, death is often the conjoint result of asthenia, of anæmia, and of apnœa. For an excellent account of this subject, see Dr. Watson's Lectures, vol. i.

* Those who always live above par, says Hunter, are extremely liable to sink when attacked by disease or injury; for, as they are habitually at the full stretch of living, their powers cannot be excited further to meet any casual emergency. —On the Blood, chap. ii. sect. 1.

enema (F. 102), or by a mustard poultice (F. 156) to the epigastrium. —*Hiccup* may be relieved by small doses of sp. ætheris comp.—*Convulsions*, *delirium*, and *coma*, are to be treated according to the state of the circulation ; by ammonia and stimulants whilst it is depressed, but by a very cautious bleeding, or leeching, or purging, or application of cold to the head, if they remain after the circulation is restored, and the pulse has become firm.—In an extreme case it might be worth while to kill a sheep, strip off the skin immediately, and wrap the patient in it. Baron Larrey had seen this done by certain humane Esquimaux, with the greatest benefit, to some shipwrecked Frenchmen that were half dead with cold, fatigue, and hunger ; and he put it in practice with equal success in the case of Marshal Lannes, Duc de Montebello, when he was dangerously bruised by a fall from his horse during one of Napoleon's Spanish campaigns.

Finally, the vulgar and mischievous habit of bleeding patients immediately after an injury, before they have recovered from a state of faintness and depression, needs only to be mentioned to be condemned.

CHAPTER II.

OF PROSTRATION WITH EXCITEMENT, AND DELIRIUM TRAUMATICUM.

DEFINITION.—" Prostration with excitement and excessive reaction," is the term used by Mr. Travers to signify a state which sometimes follows the collapse from a severe injury.

SYMPTOMS.—The symptoms vary extremely in different cases, although they present the uniform character of *extreme and exhausting excitement*, without genuine febrile action. There is great anxiety about the region of the heart: the respiration is oppressed and sighing ; the pulse exceedingly rapid and bounding, but soft and compressible ; the face is flushed, and there is vomiting. But, in the majority of these cases, the principal feature is the excitement of the nervous system, which is manifested by a peculiar delirium (*delirium traumaticum*) precisely similar to the *delirium tremens*. The tongue is moist and tremulous; there is a general tremor of the muscles; the skin is covered with perspiration; the patient is totally sleepless, irritable in his temper, answers questions in a snappish, or peevish, or incoherent manner; is often anxious to call himself perfectly well; and, as the malady increases, he becomes restless, impatient, and talkative ; wishes, perhaps, to get out of bed, and attempts to injure his attendants, and soon becomes most furiously maniacal. In some cases, however, the delirium is of a milder cast ; the patient is haunted with extravagant ideas and spectral illusions ; or fancies himself busied in his ordinary avocations, and talks perpetually about them.

TERMINATIONS.—The *prognosis* will be very unfavourable if the excitement is violent, as that soon leads to coma and death. There will be some hope, however, if the pulse becomes more tranquil and firm, and especially if the patient sleeps.

CAUSES.—The exciting causes of this state are (surgically considered) mechanical injuries acting on weak constitutions, especially in the case of persons of middle age and plethoric habit, who habitually indulge in excess of food and spirituous liquors.

TREATMENT.—The indications are to moderate the excitement, procure sleep, and support the strength.

"If in twelve hours, or earlier, after an injury," says Mr. Vincent, "the pulse does not indicate increased action, if it becomes fluttering and unequal, when the surface does not seem to evolve heat; when the countenance is listless, and the patient reports himself better than it might be expected: and particularly if he is not clear in his answers, then the best of all stimuli, brandy, should be thrown in, and if there be delirium, opium." The opium may be given either in one full dose (such as gr. ii.—iii. of solid opium, or ♏ xl.—lx. of Battley's solution), or in repeated small doses (such as gr. $\frac{1}{4}$—$\frac{1}{2}$, every hour or two hours); the repeated small doses being, perhaps, best, if debility and restlessness are very great. Dupuytren believed that opium was most efficacious in these cases when administered in the form of enema. Beef-tea and other mild nourishment should be given, and, if the patient be an habitual drunkard, it will be advisable to allow him to choose his favourite stimulus. Mental excitement is better allayed by one or two kind but firm attendants than by straps and straight waistcoats. The head should be frequently bathed with tepid water; and the bowels be opened by mild aperients. In cases in which the excitement presents somewhat of an inflammatory character, it may be advisable to try the effects of tartar emetic with the opium F. 68. In the last stage, when coma supervenes, counter-irritation by means of sinapasms or blisters to the scalp, or feet, or calves of the legs, may be tried, but scarcely any means will avail.*

CHAPTER III.

OF FEVER.

SECTION I.—OF FEVER GENERALLY.

GENERAL DESCRIPTION.—Fever may be described as a state in which all, or most of the functions of the body are deranged. The nervous system is shown to be deranged, by the headache, pain in the back, lassitude, muscular weakness, mental torpor, and confusion of the senses. Chilliness and burning heat testify to disorder of the process by which animal heat is produced or regulated. Respiration and circulation are either slow and embarrassed, or performed with preternatural frequency and force. Digestion and nutrition are suspended, hence the rapid emaciation. The secretions are either deficient, or, if abundant, are depraved; hence the thirst, dry skin, scanty urine, and costiveness or diarrhœa. Moreover, the fluids have a tendency to be vitiated, and the solids to be diseased, as shown by the tendency to congestion and effusion in the great cavities.

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* Copland's Dict. *Art.* Delirium, Graves's Clinical Medicine, 1843, p. 452: Vincent, Observations on Surgical Practice, Lond. 1848, p. 105.

Fevers are often divided into two grand families; the *idiopathic* and the *symptomatic*. The former arise from agents operating on the blood or nervous system: ague and typhus are examples. The latter are called *symptomatic*, because produced by disease or injury of some part. It is with these that the surgeon has to deal; and there are the following varieties, which we shall treat of successively:

(1.) If there be violent inflammation in a healthy system, the fever will be *inflammatory*, which is commonly called *symptomatic fever*. (2.) If there be acute inflammation in a weakened or cachectic system,—or if the inflammation arise from certain specific causes of a depressing tendency, such as morbid poisons,—or if it attack certain structures, as the veins;—the fever is generally called *irritative*. (3.) If the inflammation have terminated in an exhausting suppuration, or if there be a permanent disease, which the constitution has no power to vanquish, *hectic fever* will be established. (4.) When the vital powers are entirely exhausted the fever assumes what is called a *typhoid* type; which, in the emphatic language of Hunter, is termed dissolution. (5.) Lastly, fever, even when arising from a local cause that is permanent, may be *intermittent*; that is, may occur in definite paroxysms, with intervals of health, like ague fits. This is often the case in diseases of the urinary organs, such as strictures and fistulæ in perinæo: and sometimes in worms and other states of irritation of the intestines.

SECTION II.—OF INFLAMMATORY FEVER.

SYN.—*Synocha*, Cullen.

GENERAL DESCRIPTION.—This fever accompanies every acute inflammation which arises from a severe or considerable injury, or which affects parts of great sensibility and importance in healthy subjects. And it is almost a natural concomitant. "Nature," says Hunter, "requires to feel the injury; for where after a considerable operation there is rather a weak, quiet pulse, often with a nervous oppression, with a seeming difficulty of breathing and loathing of food, the patient is in a dangerous way. Fever shows powers of resistance; the other symptoms show weakness, sinking under the injury."*

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* On the Blood. Chap. iv. sect. 6. Vincent, op. cit. p. 104.

SYMPTOMS.—Shivering; succeeded by increased heat:[*] preternaturally frequent, hard, and vibratory pulse;—pain and aching in the head, back, and limbs, with a sense of lassitude and weakness;—general deficiency of the secretions; dry skin; dry and white tongue; thirst; nausea and loss of appetite; constipation: scanty and high-coloured urine;—the blood generally buffed and cupped;—slight aggravation of the symptoms in the evening, often delirium in the night, and slight remission in the morning.

TERMINATIONS.—(1.) If the patient recover, the urine becomes more copious, and deposits a *lateritious*, or brick-dust, sediment; the tongue becomes moist and clean, the skin cool and perspiring: the local inflammation either is resolved, or proceeds to a healthy suppuration; and the return of the appetite and of the other natural functions indicates the patient's recovery. The formation of pus often appears to be a natural crisis. (2.) But if from the irreparable nature of the disease or injury, or from the irritability of the system, life is destined to be destroyed, the pulse becomes continually more frequent, and subsequently weak, irregular, and intermittent, the extremities cold, and life soon ceases with the failure of the circulation.

TREATMENT.—The treatment of this fever is included in that of acute inflammation, of which it is the shadow. But it must be observed in this place, that when it is symptomatic of an inflammation that is unavoidable (as after a compound fracture, and most other severe injuries), it cannot be cut short, although its undue violence may be abated;—and that great care should be taken not to weaken the patient too much by depletion, especially if the part injured be not of vital importance, and its reparation will require time and strength. The indications are, to allay vascular action and nervous irritation, and to restore the secretions. And the means are, rest, low diet, aperient and febrifuge medicines, anodynes at bed-time when the bowels have been cleared, and general or local bleeding, if demanded by the exigencies of the case. We must add that purgatives should be avoided when it is likely that they may occasion an injurious disturbance of any diseased or injured part, as a compound fracture, for instance.

OF THE PULSE.—It may be convenient to say a few words in this place about the pulse. The *elements of the pulse* are three; namely, *first*, the contraction of the heart, which propels blood into the arteries;—*secondly*, the yielding and dilatation of the artery, which when felt constitutes the *pulse*;—and, *thirdly*, the return of the artery to its former calibre. Now some of the properties of the pulse depend on the heart, and some on the arteries. Thus its *frequency* and *slowness* correspond to the number of the heart's contractions in a given time.

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[*] The increased heat of fever depends, according to Liebig, on an unnaturally rapid transformation and oxydation of the animal tissues, by which an unnatural amount of heat is generated, as well as of circulating force. Liebig's Animal Chemistry by Gregory, p. 256. In ordinary fever, the heat of the blood does not rise more than three or four degrees above the natural standard; but in scarlet fever it is said to have risen so high as 116°.

Its *quickness* (or *sharpness*) depends on the velocity and impetus with which each individual contraction is made. If the artery, through what is called its *tonic* contraction, offers some considerable resistance to the ingress of the blood, the pulse will be *hard;* feeling like whipcord, and not stopped by very slight pressure with the finger; whilst, on the other hand, if that contraction is trifling, so that the vessel yields readily to the impulse of the blood, or the pressure of the finger, the pulse will be *soft.* The *vibratory* feel, or *thrill*, or *jar*, is caused by an irregular dilatation of the artery, which dilates with an innumerable number of stops and interruptions. The *full* and *small* pulse depend in some measure on the quantity of blood in the system, but principally on the state of the vessel; for if that does not dilate freely, the pulse will be small. A small hard pulse is a much safer indication for bleeding than a full soft one.

In the fever accompanying acute inflammation of any *common* part, such as skin, cellular tissue, or muscle, or of the eye, dura-mater, or pleura, the pulse is generally *frequent, hard,* and *full.*

During acute inflammation, however, of the brain and stomach—parts most essential to life—or of the peritoneum, testicle, and kidney, which are most intimately connected with the stomach by the sympathetic nerve, the vital powers seem to be depressed, and the pulse is *frequent, hard,* and *small.*

Again, during acute inflammation in a very weak and irritable constitution, the pulse may either be very *frequent, soft,* and *small,* or *frequent, soft, large,* and *jerking;* the soft jerking quality indicating an almost passive yielding to the heart's impulse, and being caused by an absence of that contractile tone which renders the pulse small and hard.* *A frequent, sharp,* and *jerking* but *soft* pulse is also found after great loss of blood, and in other cases of great debility and great excitement combined.

BUFFY BLOOD.—It was observed in the preceding page, that blood drawn during the existence of acute inflammation is usually *buffed* and *cupped:* that is to say that the clot has on its upper surface a layer of a yellowish white, or *buff* substance; which substance generally contracts so as to make the upper surface of the clot concave, or *cupped.*

What is the exact *physical condition* of the blood, to which the buffy coat is owing? This is a question which has received many discordant answers. It was formerly said that blood which exhibited the *buff* coagulated very slowly, so that the red particles had time to sink, and leave the upper surface of the clot colourless. Hunter supposed that the specific gravity of the red particles was increased, through which they sank to the bottom more quickly than in healthy blood.

The most modern and most probable explanation however is, that the blood under certain conditions, contains an increased quantity of fibrine; and that the red globules have a greatly increased attraction for each other, so that they form themselves quickly into a sponge-work, which quickly contracts, and sinks towards the bottom of the vessel, squeezing out some of the *liquor sanguinis* from its meshes, before the latter has separated into fibrine and serum. This liquor sanguinis, so separated from the globules, forms the bluish white layer which is well known to appear on the surface of inflamed blood very soon after it is drawn. And the fibrine which it contains being deposited on the surface of the sponge-work formed by the globules constitutes the buffy coat.

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* Wilson Philip. Experimental Inquiry into the Laws of the Vital Functions, p. 323, 3rd edition. See also Hunter on the Blood, chap. iii. sect. 5.

In order to show the buffy coat, the blood ought to be drawn quickly, in a full stream, into a deep vessel, in an apartment, the temperature of which is tolerably high. If drawn in a small trickling stream, into a flat and shallow basin, in the cold, the buff will not show itself.

We must observe, in conclusion, that the buffy coat is not to be considered as an invariable evidence of inflammation. For, in the first place, it may be present when there is no inflammation;—as in pregnant women; in the plethoric; in persons accustomed to be periodically bled, or who are habitually exposed to the night air.* Still less is it *per se* to be considered a warrant for bleeding: for in rheumatism it persists to the last, though the patient's veins be drained of blood. Neither does its absence prove that there is no inflammation going on; for it may be entirely absent in certain inflammations of a low type, and in the inflammations arising from certain morbid poisons, as glanders, or in the course of typhus fever, when the blood, having lost its vital qualities, scarcely coagulates at all. Moreover a very great density of the blood, such as exists at the commencement of many acute inflammations of a sthenic type, may prevent the buffy coat from appearing, till that density has been reduced by bleeding. Thus it may happen that the first teacupful drawn may display no buff, whilst the second may display it in abundance.†

SECTION III.—OF IRRITATIVE FEVER.

GENERAL DESCRIPTION.—The term Irritative Fever seems to be conventionally assigned to a form of violent and dangerous constitutional disturbance, which apparently combines the characters of inflammatory fever and of that state which we have before described under the term, prostration with excitement.

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* Samuel Cooper. First Lines of Surgery.

† Vide Hewson, Experimental Enquiry into the Blood. Lond. 1772, chap. ii. pp. 34, et seq. Palmer's edition of Hunter, vol. iii. p. 39, *note*. Copland's Dict. Pract. Med. *Art.* Blood; Thackrah. C. T. on the Blood, Lond. 1834; Davy's Experimental Researches, vol. i. Lond. 1839; Müller's Physiology by Baiy, 2nd ed. vol. i.; Andral, Arch. Gen. de Med. 1840, and Brit. and For. Med. Rev. vol. xi. p. 243; T. Wharton Jones, Brit. and For. Med. Rev. Oct. 1842. Some observations of Mr. Gulliver, quoted in Ranking's Half-yearly Abstract, vol. i. p. 251; Garrod's Lectures in Lancet. 1848. vol. ii. p. 113; and A. H. Hassall's Microscopic Anatomy, vol. i. p. 12.

The *Symptoms* and *Treatment* will be particularised under the head of the various local affections which this fever accompanies. The leading features are great restlessness and anxiety, debility, depression of spirits, weight at the præcordia, oppressed respiration; frequent rigors; pulse rapid and sharp, but variable in force; death, preceded by low delirium, and signs of great exhaustion. The treatment must, as a general rule, consist in the invigoration of the vital powers by cordial stimulants and tonics, the evacuation of depraved secretions, and the removal of pain and irritation, and of local disease, by whatever measures are most appropriate.[*]

SECTION IV.—OF HECTIC FEVER.[†]

DEFINITION.—Hectic fever is an habitual disorder of the system, when irritated by some long-standing disease, or source of weakness which it is unable to remove. It is a remittent fever, and is generally accompanied by a tendency to increase of one or more secretions.

SYMPTOMS.—Emaciation and debility; tongue morbidly clean and red, especially at the tip and edges; appetite often inordinate; disposition alternately to diarrhœa and profuse perspiration;[‡] pulse frequent and small;—a febrile exacerbation comes on every evening (or oftener, especially after meals) with slight chills, followed by heat of skin, burning of the soles of the feet and palms of the hands, and a circumscribed flush in the cheeks;—thirst and restlessness, preventing sleep till after the middle of the night, when the patient falls asleep, and suddenly awakes in a profuse perspiration;—often buoyancy of spirits and hope to the last.

TERMINATIONS.—(1.) If it be about to terminate fatally, the debility increases; the diarrhœa and perspiration become more profuse and exhausting: the legs become œdematous; aphthæ form; and great pain, griping, and tenesmus attend the diarrhœa, owing to an inflammatory or ulcerated condition of the intestines. The patient may expire suddenly, the heart failing from mere debility; or death may be preceded by typhoid symptoms. And this fatal termination may be owing either to the continuance of the original disease, or to the induction of secondary disease in the lungs or mesenteric glands. (2.) Recovery from hectic is often remarkably rapid, if the causes be removed; provided that no secondary disease has commenced.

CAUSES.—Any chronic organic incurable disease;—whether incurable from its *nature*;—from its *extent*;—or from *constitutional debi-*

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[*] See the Sections on Diffused Inflammation of the Cellular Tissue; on Dissection Wounds, and on Phlebitis.

[†] From ἕξις, ἑκτικὸς, habit, habitual.

[‡] Called *colliquative* (*liquo*, I melt), because they exhaust the system.

lity; also exhaustion from profuse suppuration;—or from any other great and continued discharge; as prolonged lactation, leucorrhœa, and so forth. Hectic is so frequently caused by profuse suppuration, that an absorption of pus was formerly deemed to be its invariable and efficient cause. Hunter denied this theory—1st, because hectic may arise from organic disease, or from excessive discharge of any secretion when there is no suppuration; 2ndly, because pus may be absorbed (as it often is from chronic abscesses and buboes, which are discussed without being opened) without the production of hectic.* It is certain, therefore, that absorption of pus is not the *only* cause of hectic. But it is equally certain that pus (or rather its constituent parts in a dissolved or disorganized state) is absorbed from extensive suppurating surfaces; and it is probable that its presence in the blood adds to the hectic and constitutional debility; and that (especially if it be vitiated or decomposed) it tends greatly to the production of colliquative diarrhœa and ulceration of the intestines. For the injection of pus or putrid matter into the blood almost invariably causes diarrhœa;—an effect also which is notoriously produced among students, who absorb the putrid vapours of the dissecting-room.†

TREATMENT.—The indications are (1) to remove the local cause; or (2), if that be impracticable, to enable the system to support it.

The *first* indication may often be fulfilled by an amputation or other operation; and it is well known that hectic patients often bear operations extremely well, recovering from them rapidly, and making but one step, as it were, from death's door to perfect health.‡ In cases not admitting or requiring an operation, local mischief must be remedied, and profuse discharges restrained as far as possible.

As for the *second* indication, the strength must be maintained by giving as much food as the stomach can digest with comfort; but the quantity of animal food and of fermented liquids must not be large enough to add to the excitement, or increase the heat of skin, thirst, and perspirations. Arrowroot, and other farinaceous preparations; jellies, Iceland and carrageen moss, are useful as mild nutritives occasionally, when there is an excess of heat and feverishness; but these slops should not be given at such times, or in such quantities as to interfere with the digestion of more solid food, if there is an appetite for it. *Tonics* may be given to support the strength; such as bark, quinine, or cascarilla, and especially the cod liver oil; or sometimes the preparations of iron; but if, at any time, in the varying progress of the disease, excitement appear to prevail, the pulse being more accelerated, and pain aggravated, tonics and animal food must be for a time exchanged for saline medicines, and farinaceous or milk diet. *Opiates* must be given to procure sleep and allay pain. *Change of air* is always advantageous. *Profuse perspirations* may be checked by diluted sulphuric or nitric acid, with tonics, as in F. 1, and by tepid sponging. As it will be recollected that the *diarrhœa* often depends on an inflamed or ulcerated condition of the intestinal mucous membrane, reason will suggest that attempts to stop it by port wine, and large doses of catechu, or other stimulants and astringents, will often be not only unavailing, but irritating and mischievous; although good enough in cases of mere debility. If, therefore, the diarrhœa is attended with tenderness, much pain, and tenesmus, the proper remedies are, rest in bed; mustard poultices to the abdomen;—the very mildest diet of milk, arrowroot, &c., enemata of starch, containing from twenty to sixty minims of laudanum (F. 101);—Dover's powder or F. 63, 64 at bed-time, and small doses of chalk or bismuth mixture, with a few minims of laudanum, during the day; and one or two grains of blue pill, with three or four of rhubarb occasionally, if the liver is inactive. It may be added, that copious injections of warm water give great relief in all cases of diarrhœa; soothing the irritating membrane, washing away acrid secretions, and enabling the patient to pass easily at once what otherwise would occasion several painful efforts.

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* On the Blood. Chap. ix. sect. 1.

† Copland; Dict. Pract. Med. *Art.* Hectic, p. 965. See also the section on Chronic Abscess.

‡ "The removal of a diseased part which the constitution has become accustomed to, and which is rather fretting the constitution, is adding less violence than the removal of a sound part in harmony with the whole." Hunter on the Blood, chap. ii. sect. 2.

SECTION V.—OF TYPHOID FEVER.*

GENERAL DESCRIPTION.—This fever is an acute form of constitutional disturbance, occurring when the powers of life are much exhausted or depressed. It may be a sequel of the hectic; or of the state of prostration with excitement; or it may supervene very soon after an injury.

SYMPTOMS.—Pulse very frequent and weak, or jerking; skin hot and very dry; all the secretions deficient; tongue dry, brown, and tremulous; lips parched; if there be a wound, it becomes dry, livid, and glassy, and ceases to suppurate.

TERMINATIONS.—(1.) If the patient is to die, the pulse becomes more rapid, thready, and tremulous, and at last is imperceptible at the wrist; the eyes look dull, and glassy, and sunken; the temples and nostrils are pinched, from atony of their muscles;—the patient lies on his back, and sinks towards the foot of the bed;—there is frequent hiccough; the abdomen is tightly distended with flatus, and the sphincter is relaxed, so that stools are passed involuntarily; the patient dozes imperfectly, awaking with a start; he picks imaginary objects on the bedclothes, and mutters to himself;—there is starting or twitching of the tendons; at last the skin becomes cold and clammy, respiration slow and laborious, and coma supervenes, soon followed by death. (2.) If recovery occurs, the surest sign of amendment is a diminution of the frequency and increase of the firmness of the pulse, with sound sleep; the patient being sensible and composed, the eyes brighter, the tongue cleaning, and above all, suppuration returning, if there be a wound.

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* It must be understood that the term *typhoid fever*, is used here to signify a typhoid type of symptomatic fever, that is, of fever arising from local disease; and not the idiopathic typhus, or *fièvre typhoide*.

Causes.—Typhoid fever may be caused (1) by some circumstance producing immediate and direct depression of vital power; such as traumatic gangrene; a wound poisoned during dissection; or a severe injury or operation suffered by an habitual drunkard. (2.) It may be caused by some disease of long standing, which has completely exhausted the constitutional powers—as profuse suppuration with hectic. And both these conditions may be, and frequently are, combined with a third; namely, (3) contamination of the blood by putrid or other poisonous matter. Thus it is sure to supervene if putrid pus be confined in an abscess, or if putrid urine escape into the cellular tissue of the perinæum. M. Bonnet has proved incontestably that the hydrosulphate of ammonia, the product of putrefaction, is absorbed in these cases, and is one cause of the typhoid fever.*

Prognosis.—The prognosis will, of course, be always doubtful; but there may be a chance of recovery, if the cause is of recent existence, and admits of removal by operation or otherwise; whilst there can be scarcely any, if the constitution has been exhausted by its long continuance. Thus, if this fever comes on in erysipelas or small-pox, diseases of no long continuance, the constitution may rally;—or if it is caused by a recent injury, or by extravasation of urine, it may be removed, perhaps, by an amputation, or incisions in the perinæum; but it will scarcely be cured if caused by chronic abscess or disease of a joint, and preceded by hectic. And thus, if the hectic has been suffered to pass into the typhoid state, the season of amputation and hope of recovery are also past. "It is," says Hunter, "the more incurable, as it is more connected with the past than with the present."

Treatment.—The indications are to remove the cause; allay irritation, and support the strength. If the removal of the cause by operation is likely to be successful, upon the principles just laid down, it should be done without delay; and, even if not, it may be better to try a doubtful remedy than none at all.

As for the general treatment, opium, or some of its preparations, should be given in small doses, repeated frequently, or in a large dose at once, according to the judgment of the practitioner, for the relief of restlessness and delirium. The strength must be supported by quinine and tonics; by wine, and other stimulants, F. 1, 26, 27, &c., and by moderate quantities of broth, beef-tea, arrowroot, &c., if the patient will take them. Hiccough is best relieved by a tea-spoonful of sp. æther, c.; and flatulence by an enema of turpentine, or confection of rue. The catheter should be used if the patient cannot pass his water: a point that should always be inquired into.

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* See Chronic Abscess.

CHAPTER IV.

OF TETANUS.

SECTION I.—INTRODUCTORY.

Definition.—Tetanus is a disease manifested by tonic* spasm and rigidity of some, or many, of the muscles of voluntary motion.

Divisions.—(1.) It is divided into the *idiopathic*, or that which arises solely from some disorder of the system, and the *traumatic*, or that which is caused by a wound. (2.) It may be *acute* or *chronic ;* (3.) It may be *general* or *partial ;* and when partial it is mostly confined to the neck and jaws, constituting *trismus*, or locked jaw. (4.) It is called *opisthotonos*, when the body is curved backwards, which it most commonly is ; *emprosthotonos*, when it is curved forward ; and *pleurosthotonos*, when it is drawn to one side, this being the most uncommon.(a) (5.) The *trismus infantum*, or *neonatorum*, which attacks children soon after birth, is usually made a distinct species. (6.) Tetanus may in its *type* be *intermittent*, when it is caused by marsh miasmata, as it may be occasionally, like almost every other nervous affection. (7.) Lastly, there is the *hysterical tetanus ;* in which all the outward symptoms of tetanus are produced, as a consequence of an hysterical state of the system.

SECTION II.—OF ACUTE TETANUS.

Symptoms.—The patient first complains of stiffness and pain of the neck and jaws, as from a cold ; his voice is husky ; it is difficult for him to put out his tongue, and his countenance is observed to have a peculiar expression, resembling a painful smile, because the corners of the mouth and eyes are distorted and puckered by incipient spasm of the facial muscles. In the next place, the muscles of mastication and deglutition become fixed and rigid with spasm, so that the mouth is permanently closed, and there is great difficulty of swallowing, especially liquids. To these symptoms succeed a fixed pain at the pit of the stomach shooting to the back, and a convulsive difficulty of breathing, indicating that the diaphragm and muscles of the glottis are affected ; and the spasm now extends to the muscles of the trunk and limbs, rendering them completely fixed and rigid. The abdomen feels remarkably hard ; there is obstinate constipation, and frequently difficult micturition from spasm of the perinæal muscles ; the pupils are contracted : and the saliva flows from the mouth, because the patient is unable to swallow it. This spasm never ceases entirely; but it has occasional remissions of violence, alternating with aggravated paroxysms, which are easily induced by the slightest irritation or disturbance: there are generally some snatches of relaxation during sleep. Meanwhile the intellect is undisturbed, and the pulse may be natural, except during a severe paroxysm, which quickens it, and causes perspiration and thirst.

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* Spasms are of two kinds : the *tonic* in which the rigidity is permanent ; and the *clonic*, in which contraction alternates quickly with relaxation, as in epilepsy and hysteria. The small letters refer to a note at the end of the chapter.

Terminations.—(1.) If the case is about to end *fatally*, the paroxysms become more frequent and violent, and the breathing more and more embarrassed by spasm of the diaphragm and of the muscles of the glottis; and at last the patient dies, either from exhaustion or from suffocation;—either the nervous system being worn out by the violence of the spasm, or the respiratory action being suspended long enough to cut off the necessary supply of arterial blood from the brain, and so induce insensibility. The most usual *period of death* is the third or fourth day; sometimes it is postponed till the eighth or tenth, but rarely later. On the other hand, there is the case (b) recorded of a negro who injured his hand, and died of tetanus in a quarter of an hour; and cases of death within twenty-four hours are by no means uncommon. (2.) When acute tetanus terminates favourably, still the patient's recovery is not complete for weeks or months;—partly because of the strainings and lacerations which the muscles have suffered,—partly because of the remaining tendency to spasm, which very slowly yields, and is apt to be temporarily aggravated by very slight causes, especially cold and damp. But in some rare instances the disease has been removed almost instantaneously by the removal of its exciting cause.

Prognosis.—The prognosis in acute tetanus is extremely unfavourable, especially if traumatic; it is more favourable in the idiopathic, and the chronic generally gets well of itself. Death very seldom occurs after the twelfth day. Dr. Parry(c) attempted to found a prognosis on the state of the pulse, and thought that if on the fourth day it was under 100 or 110, the patient being an adult, the prognosis was favourable;—but if above 120, unfavourable. But although it is true that the pulse is in general accelerated towards the close of the malady, still some fatal cases have occurred in which it never rose above 80 or 90. As a general rule, it may be said that the prognosis is *favourable* if the complaint is partial;—if it does not affect the muscles of the glottis;—if it has lasted some days without increasing materially in severity;—if it is sensibly mitigated by the remedies employed;—if the pulse is not much accelerated;—if the patient sleeps; and if he has been subject to it before in an intermittent form. On the other hand, the prospect will be *unfavourable*, if the spasms continually increase in severity, and especially if they affect the muscles of the glottis.

Diagnosis.—Tetanus resembles *hydrophobia* in the difficulty of swallowing and in the aggravation of the spasms by slight external irritants; but it may be distinguished by the spasms being *continuous*, and by the patient being in general sensible, and calm to the last;—whereas in hydrophobia, there are fits of general convulsions with *perfect intermissions*, and the patient is mostly delirious, with a peculiarly wild haggard expression of countenance. *Inflammation of the spinal cord*, or its membranes, resembles tetanus in being accompanied by opisthotonos and spasmodic difficulty of swallowing; but it may be distinguished by the pain in the back and fever being more predominant than in any case of mere tetanus, and by the paraplegia and coma which supervene in most cases.

MORBID ANATOMY.—The morbid appearances that have been found in different cases are as follow:—Increased vascularity of the membranes and substance of the *spinal cord*, with or without effusion of serum;—more rarely the same appearances have been found in the cranium;—flakes of cartilage and spicula of bone deposited in the membranes of the spinal cord;*—vascularity of the nerves leading from the wounded part;—of the mucous membrane of the stomach; and of the sympathetic ganglia;—and congestion of the lungs. But there is not one of these morbid changes that is constantly, and, except the first, there is not one of them that is even frequently, found. The muscles are extremely rigid after death, and ecchymosed or ruptured in many parts;—the blood is mostly uncoagulated.

CAUSES.—Tetanus may be caused by wounds and external injuries of every description, but especially by lacerated and punctured wounds of the hands and feet, gun-shot wounds, compound fractures, compound dislocation of the thumb, and wounds irritated by foreign matters, or in which nerves are exposed. Mr. Morgan has known it even caused by a blow with a schoolmaster's ferule; but it is very rarely caused by clean simple incisions. The period at which it may come on after the injury is very uncertain. Sometimes it occurs very quickly, if the patient is predisposed to it. Sometimes it seems to be induced by the great pain and irritation of a wound during its inflammatory state: but the most common period is, when the wound is nearly healed. Why this is so, is very difficult to explain; but some attribute it to a rapid cessation of suppuration, and others (as Trnka and Travers) to an irritation of the nerves by the contraction of the cicatrix.

It is probable, however, that in most instances some concurrent or predisposing cause, in addition to an external injury, is required to produce tetanus. Of such causes, the best established are, 1st. an irritated state of the gastro-intestinal mucous membrane; (^{d}) and.

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* Extract from the report by Mr. Arnold of *post mortem* appearances in the case of a man who died of idiopathic tetanus in Guy's Hospital, Lancet, 1844, vol. ii. p. 353. "Blood-vessels on the spinal marrow much congested; frequent adhesions between the layers of the arachnoid from about the seventh dorsal vertebra upwards; arachnoid lining the dura mater presents a minutely granular appearance. Several plates of bone upon the free arachnoid, chiefly opposite the seventh dorsal vertebra. These plates of bone are confined entirely to the posterior surfaces."

2ndly, exposure to cold damp night air during warm weather, or in a warm climate; consequently, tetanus is much more prevalent and fatal in warm than in cold or temperate climates.

The same causes, cold and visceral irritation namely, which predispose to the traumatic, may of themselves produce the idiopathic tetanus. Thus the latter may be a consequence of various visceral irritations, especially of the womb. Whytt gives the case of a girl, aged twenty, who caught cold during the menstrual period, and died of tetanus in eighteen hours; and the author knows a case in which fatal trismus followed uterine irritation, consequent on abortion.(e)

Tetanus may also be caused by certain narcotico-acrid poisons, especially the nux vomica, cicuta aquatica, and a Javanese poison called *chetik*.

Pathology.—The spasms of tetanus, affecting as they do all the voluntary muscles, must evidently depend on some morbid condition of that central organ, the spinal cord and medulla oblongata, from which all the voluntary muscles are supplied with nerves. And this morbid condition may depend on *centric* causes, that is on causes affecting the spinal marrow itself; or on *excentric* causes; that is to say, on irritation of some other part of the body, which irritation is conveyed to the spinal cord by the *sentient* or *afferent*, or, in Dr. Hall's language, *excito-motor* nerves.

With respect to the *nature* of this morbid condition, it cannot be regarded as essentially inflammatory, because the spinal cord is often found after death without a trace of vascularity, and because tetanus may be established during a state of depression and collapse that would be quite incompatible with inflammation.

Although, however, it is most certain that inflammation is not essential to the existence of tetanus, still it is equally certain that there is one class of tetanic cases which presents a well-marked inflammatory character. They commence with shivering and pain, are attended with fever, and, if fatal, display on inspection, congestion, serous effusion, softening or purulent deposit, in some part of the brain or spinal cord.(f) But this class is by no means a majority.

It must be concluded, therefore, that tetanus is merely a manifestation of functional disorder in one department of the nervous system, and that the nearest approach we can make to a correct pathological definition is to say, that it consists in an *unnatural excitability* of the spinal cord, through which it produces spasm of the voluntary muscles; a spasm that is aggravated by the slightest impression on the *sentient* or *afferent* or *excito-motor* nerves.

Treatment.—Bearing in mind what has been just said, viz. that tetanus seems to depend on an unnatural excitability of the spinal cord; and that it may be caused either by (*centric*) changes in the cord itself, or by (*excentric*) irritation of other parts of the body, it will be evident that the rational indications in the treatment must be, first, to remove all *excentric* causes of irritation, whether caused by a wound, by sordes in the bowels, or the like; 2, to diminish *centric* irritation depending on a diseased or congested state of the cord; and 3, to relieve the unnatural excitability. (g)

In the *local treatment*, the first points to be accomplished are, to remove all extraneous bodies from the wound, if there be one; to make incisions, if necessary, for the free discharge of pus, or for the relief of inflammatory swelling and tension; and if any isolated portion of nerve or tendon happens to be on the stretch, to divide it. Then the part may be fomented with warm decoction of poppies; after which, a solution of a scruple of opium, or extract of belladonna in an ounce of water, may be applied on lint, and the whole part be enveloped in large soft poultices. Sundry other measures have been proposed, in order more effectually to remove local irritation: such as the division of the principal nerve leading from the wound; or, as Mr. Liston has proposed, the making a Λ incision above, so as to isolate it and cut off as much nervous communication as possible; or the destruction of a ragged, contused, ill-conditioned wound by *actual cautery*, as Larrey and others have practised with great benefit; or the *excision of the wound* if cicatrized or nearly so. Sometimes, when the wound is nearly cicatrized, or has ceased to suppurate, the application of a blister or of strong stimulating ointments has been of service; but, as Mr. Curling (h) observes, it happens, unfortunately, that the tetanic condition of the spinal cord, when fully established, is mostly independent of its local exciting cause, and does not cease on its removal. Hence *amputation* of the injured part has very rarely been successful, and has even aggravated the mischief; so that as a general rule, it ought not to be performed, unless desirable for some other reason besides the tetanus.

We must next review the *constitutional remedies* that have been employed in tetanus, stating their relative utility, and the cases in which they are most likely to be beneficial.

1. *Antiphlogistic measures.*—Bleeding may be used in cases attended with marked inflammatory symptoms, or if the habit be full, and the wound hot, swelled, and painful. In other cases it should not be employed at all.

Mercury in similar cases, given so as to induce ptyalism, has often appeared to do good.

Purgatives are always indicated; and the most active ones must be chosen. Thus, at the outset of the malady, a powder of calomel and jalap mixed with butter should be put at the back of the tongue for the patient to swallow, and should be followed in an hour with a draught containing ʒj. of turpentine and a similar quantity of castor oil, or by a drop or two of croton oil; and enemata of turpentine should be frequently administered until the bowels are completely unloaded. The circumstances which forbid the use of purgatives, are previous disease of the alimentary canal; dysentery, ulcers, &c.; but even then there would be no objection to unirritating enemata.

2. *Sedatives.*—Tobacco has the credit of being one of the most efficacious remedies in tetanus; but it is so fatal a poison, in an overdose,

and chloroform so much more likely to do good, that we cannot advise tobacco, unless the latter has failed. Hot brandy and water should be given if the heart's action is too much enfeebled by it. It is administered in the form of enema, of four ounces of the *enema tabaci* (F. 103). It soon induces deadly sickness, cold perspiration, fainting, and relaxation of the muscles, followed perhaps by sleep.

Cold is of eminent service to animals affected with tetanus ; and a soldier was once most unexpectedly cured by exposure all night in severe weather. It may therefore do good in some instances to apply cold extensively to the spine by means of bladders filled with ice, or various frigorific mixtures ; taking care to support the circulation by internal stimulants. But the cold bath, and cold affusion, although they are of great service in chronic tetanus, are most hazardous in the acute, and have more than once proved instantly fatal.

3. *Narcotics.*—Opium is of most undoubted efficacy in some instances, probably those attended with a painful wound, and weakness. When it produces good effects, they are soon manifest. The best way of using it appears to be by frictions with liniments containing it ; or by removing a small portion of cuticle over the spine with a blister, and sprinkling a grain of finely powdered acetate, or hydrochlorate of morphia, on the denuded cutis. If given internally it should be in large doses, and in the liquid form ; and it should be recollected that very large doses may be given with very little effect. The *resin of the Cannabis Indica*, or Indian hemp, a mild stimulant and narcotic, has been employed, with very good effects, by Dr. O'Shaughnessy and others at Calcutta, and by several practitioners in this country. The dose is gr. iij. every half hour till the symptoms are mitigated (F. 29). But the most promising remedy of this class is *chloroform* inhaled sufficiently to relieve the patient's sufferings, and to keep him moderately under its influence.*

4. *Stimulants and Tonics.*—The preparations of iron and bark have been useful in cases attended with marked debility.

Several cases are on record in which recovery followed the use of ardent spirits in very large quantities.(i) It is scarcely worth while to mention the various antispasmodics, such as camphor, musk, æther, castor, the warm-bath, assafœtida, nor yet stramonium, belladonna, or digitalis. Colchicum has been of service in some few cases ; phosphorus given in the quantity of one grain daily, in divided doses, gradually increased to four, is also said to have produced a cure in twelve days; and Cruveilhier thought that in one case, great relief was afforded by making the patient breathe rapidly and voluntarily with the diaphragm. (k)

5. *Nutriment.*—It is in all cases necessary to keep up the strength

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* Since the above was written two ably reported cases of acute tetanus have been published in the Provincial Medical Journal, May 15, 1850, by Dr. Cotton of Lynn, in one of which ether, in the other chloroform was used, with the same results which usually follow in hydrophobia, viz. the sufferings mitigated for a time, but the disease, in its essence, uninfluenced and mortal.

by beef-tea, wine, &c. Mr. Travers believes that more patients have been lost from want of nutriment than from want of medicine. But it is often by no means easy to administer food or medicine, in consequence of the closure of the jaws, and difficulty of deglutition. The former difficulty may sometimes be overcome by passing an elastic catheter through the nose, or behind the last molar teeth. But if the attempt at swallowing is attended with much spasm in the larynx, it must be abandoned, and our remedies be introduced solely through the skin, or by enema. It is both unnecessary and barbarous to force the jaws asunder, or to extract any of the teeth.

6. It is also very important to protect the patient from all sources of irritation and disturbance, since in the excitable condition of the nervous system which characterizes this disease, the smallest impression upon any of the organs of sense, such as a slight touch, or breath of air, is sure to aggravate the spasms. He should be kept quiet and in the dark; and the administration of remedies should be managed so as to cause as little annoyance as possible. Bleeding (if judged necessary) and the evacuation of the bowels, should be effected thoroughly once for all; and the patient be cautioned against speaking, moving, or swallowing oftener than he can help.

We may sum up by observing, that bleeding in moderation if indicated by inflammatory symptoms; purgatives; and chloroform, and especially the latter two remedies, are those to which the surgeon can look with most confidence in this very intractable disease.([l])

SECTION III.—OF THE CHRONIC, INFANTILE, AND HYSTERICAL TETANUS.

Chronic Tetanus is very seldom fatal, although in some rare instances the patient has died completely exhausted by its long continuance; for it sometimes lasts several weeks. The principal remedies are aperients, tonics, chloroform, and the shower-bath. The bowels should be kept freely open, but the indiscriminate exhibition of drastics should be avoided. Electricity, in the form of sparks, or weak shocks down the spine, would probably be of service.([m])

Trismus Infantum is a form of tetanus which is almost unknown in England. It was formerly, however, exceedingly prevalent in Ireland, and appears to be met with there occasionally even at present. It carries off a vast number of children in the West India Islands; and we learn from Dr. Holland, that in the desolate rocky Vestmann islands, on the south coast of Iceland, one hundred and eighty-six infants perished of it in twenty-five years, although the population does not exceed one hundred and fifty souls. The causes appear to be, want of ventilation, and filth, or the innutritious and unwholesome diet of the parents, such as the fish and sea-bird eggs that form the only sustenance of the Vestmann islanders; and the use of irritating applications to the wound left by the falling off of the naval string.

The time at which the disease appears is generally from the fifth to the tenth day after birth; hence the popular Irish term *nine-day fits.*

The *symptoms* are, locked jaw, spasmodic difficulty of breathing and swallowing, and general convulsions. They are almost invariably attended with diarrhœa, and preceded by fretfulness, startings during sleep, and unusual greediness for the breast.

Treatment of any kind is seldom successful; but it may be presumed that the warm bath, four or five doses of calomel (gr. i.—ii,) at intervals of four or five hours, a teaspoonful or two of castor oil to clear the bowels, and minute doses of laudanum (one-eighth of a minim cautiously increased) every two hours afterwards, or chloroform, are the measures most likely to be of service.(n)

Hysterical Tetanus.—It is one characteristic of hysteria, that it frequently assumes the more palpable outward symptoms of various diseases, so as to simulate them pretty completely; although proper investigation may always detect the real features of hysteria, under any mask whatever. Thus an hysterical female may be seized with stiffness of the muscles of the face and jaws, which may extend to the neck, and gradually invade the trunk and limbs, so as completely to close the mouth, and render the whole body rigid and motionless. The chief points of diagnosis are, the hysterical state of the mind; and the fact that the muscular contraction, however great, may almost always be overcome for the moment by forcing the patient to exert her volition. The best remedies are, warm aloetic purgatives, and turpentine enemata, and valerian, galbanum, and other antispasmodics of that class.

(a) Case of acute pleurosthotonos, Med. Gaz., May 12th, 1838.

(b) Rees's Encyclopædia, *Art.* Tetanus.

(c) Caleb Hillier Parry, M.D. Cases of Tetanus and of Rabies Contagiosa, Bath, 1814.

(d) For cases arising from intestinal irritation, vide Med. Gaz. vol. i. p. 646. Med. Chir. Trans. vol. vii. p. 459. Ibid. vol. vii. p. 474, et seq. Abernethy. Lectures on Surgery. Renshaw, London, 1835, p. 23. Travers. Further Inquiry concerning Constitutional Irritation, London, 1835, p. 397. Fournier-Pescay, Dic. de Sc. Méd. Paris, 1821, vol. lv. p. 9. Wincelslai Trnka de Kr'zowitz, Commentarius de Tetano, *Vindobonicæ*, 1777—the very best work on the subject extant. Dictionnaire de Médecine et Chirurgie Pratiques. Paris, 1836. *Art.* Tetanos. B. Gooch, Chirurgical works. Lond. 1792. Vol. ii.

(e) See Cooke's Morgagni, vol. i. p. 129; and the Lancet for June 2nd, 1838.

(f) For cases of inflammatory tetanus, vide Med. Gaz. vol. i. p. 645. Fournier-Pescay, op. cit. Burmester in Med. Chir. Trans. vol. ii. Francesco in Forbes's Review, Jan. 1838. Poggi, Lond. Med. and Phys. Jour. vol. lxi. p. 132.

(g) Dr. M. Hall's fourth Memoir on the Nervous system, Med. Chir. Trans. vol. xxiv.

(h) A Treatise on Tetanus, being the Jacksonian Prize Essay for 1834. By T. Blizard Curling. London, 1836. p. 122.

(i) See two cases in the Lancet for 1845, vol. i.

(k) Lancet, May 29, 1824.

(l) For an account of the proposal to cure tetanus by inoculation with the

Woorali poison, vide Waterton's Wanderings; Brodie's Papers in the Phil. Trans. for 1811, p. 178, and 1812, p. 205, and Morgan's Lecture on Tetanus.

(m) Holland, Med. Notes and Refl.; and Addison on Electricity in Convulsive Diseases, Guy's Hosp. Rep. vol. ii.

(n) See a paper by Joseph Clarke, M.D., in Med. Facts and Obs. vol. iii. Lond. 1792; Dr. Holland's Med. Notes and Reflections, 2nd Ed. p. 29: Maunsell and Evanson on Diseases of Children, 4th Ed. Dublin, 1842, p. 219; and Maxwell on Yaws and Tetanus, Edin. 1839.

CHAPTER V.

OF CONVULSIONS.

In order to complete the view of general disorders produced by local injury or disease, it is necessary briefly to allude to *convulsions*, occurring in epileptic paroxysms. These are familiar in *medical* practice, when arising from irritation of the gums, of the stomach, of the uterus, &c.; they also occur occasionally from some of the local affections which custom has assigned to the surgeon. In particular, they may arise from spicula of bone growing from the inner surface of the skull; or from slight injuries to the skull which have left the bone unsound; and especially from irritation of the urinary organs; retention of urine, renal calculus, and the like. In children, convulsions are apt to be produced by severe injuries of any kind.

Into the symptoms and treatment it is not the author's province to enter in this place. It will suffice to give the general rule, that in all obscure cases of convulsions, search should be made for *excentric* causes of irritation, and that the surgeon will do well most carefully to scrutinize the urinary and genital system, and to recollect how frequently they are caused by the retention of bile and urea in the blood.

PART II.

OF THE ELEMENTARY PROCESSES OF LOCAL DISEASE.

CHAPTER I.

OF MALFORMATION, HYPERTROPHY, ATROPHY, AND OTHER DEGENERATIONS OF TISSUES.

I. CONGENITAL MALFORMATION.—In the present part of our work we propose to give a general view of the various forms of local disease, which may be met with in any part of the body, from any cause interfering with the regular processes of nutrition and function. Amongst these, the earliest in point of time, are the various original malformations, which occur through some inexplicable defect in the vital powers of the germ out of which the fœtus is developed. Of such malformations, some depend on an *arrest of development*, through which various organs, or parts of organs, are left as it were incomplete and unfinished. Such are the cases, which come under the surgeon's notice, of *spina bifida*, or incomplete closure of the arches of the vertebræ; such are *hare-lip* and *cleft-palate*, which arise from a similar condition of the bones and soft parts of the face;—such, too, are *epispadias*, and *hypospadias*, or incomplete closure of the receptacle and ducts provided for the urine. From a like want of development, though the immediate effect is opposite, arise the conditions of *imperforate anus*, or *vagina*.

Other cases of congenital deformity are caused by local *excess of development*; such as for instance, supernumerary toes and fingers. Others again arise from defects in the relative position of twin ova; so that one fœtus becomes adherent to the other; or even becomes included within the body of the other.

Of the causes and prevention of congenital deformities, it is not worth while to speak. Of the treatment of such as are capable of relief by surgical means mention will be made in PART IV., in the chapter devoted to the organ in which each variety may occur.

II. INTRAUTERINE DISEASE.—Children are sometimes born with deformities, which ought to be distinguished from those mentioned in the preceding paragraph, insomuch as they do not result from any defect in the germinal power of development, but from diseases occurring to the fœtus, which produce within the womb the same effects that they would produce at any other period of life. Such are the congenital club-foot, and dislocation of the hip; and those very curious instances of spontaneous amputation, so called, in which one of the limbs of the fœtus becomes tightly entangled in a loop of the navel-string, or in an accidental band of lymph, and is strangulated and cut off in consequence.

III. HYPERTROPHY.—This term signifies not merely an increase of bulk, or swelling of an organ, but an increase in size, depending on an increase in its healthy structure. Genuine hypertrophy, too, is usually attended with increased *development;* that is, with the unfolding of a higher order of structure, so that the hypertrophied organ acquires new and greater powers. It is, generally speaking, a healthy and conservative process, whereby the hypertrophied organ is enabled to do more than its ordinary share of duty, and to compensate for some deficiency in some other part of the œconomy.

"The *causes* are," as Mr. Paget observes, "chiefly these three. 1. The increased exercise of a part in its natural functions; 2. An increased supply of healthy blood; 3. An increased accumulation in the blood of the particular materials which any part appropriates in its nutrition, or in secretion."

(1.) Instances of hypertrophy from the first cause specified are afforded by the bladder, which, in cases of obstruction to the passage of urine, becomes greatly more capacious, with its mucous and muscular coats developed into a state of greater power, fitting them for the increased pressure they are obliged to bear and to exert;—by the cuticle, thickened into corns by pressure and friction; and by the bursæ developed under like conditions, in the cellular tissue.

(2.) Instances of hypertrophy from increased supply of healthy blood are afforded by the growths of hair which sometimes take place in the skin in the neighbourhood of ulcers; and by the elongation of one of the bones of a limb of a growing child, which sometimes occurs when a vascular ulcer of the skin, or disease of an adjoining portion of bone, has for a considerable time caused an unusually copious current of blood to circulate in the vicinity.

(3.) Hypertrophy caused by a particular condition of the blood is exemplified in the increase of one kidney, which occurs when the other is incompetent, through disease or injury, to abstract its share of urinary matter from the blood. The ossifications which take place in the legs of certain breeds of horses are owing probably to the same cause, so perhaps is goître; the obesity of great eaters certainly is.

(4.) Lastly, hypertrophy arises occasionally from some local excess in the vital power of growth or development, whereby a portion of a bone, or of the fatty tissue will grow disproportionately to the rest of the body, and form a tumour.

The *treatment* of hypertrophy must consist in removing the causes if possible.

IV. ATROPHY is the reverse of hypertrophy; it is the wasting of an organ in size, with probably a degeneration of its structure into one of lower powers, or a transmutation of its tissues into fat. As hypertrophy is not increase of bulk merely, so atrophy itself may be accompanied with no decrease of bulk, or even with an increase; but then, the increase is due to an interstitial deposit of fat, whilst the proper working tissue of the organ is decreased.

The *causes* of atrophy are—1st. Disuse, or want of exercise, which is sure to cause any organ, be it brain or muscle, to waste.

2ndly. Diminished supply of blood may in some cases cause atrophy, as in others it causes ulceration or gangrene; but an organ whose vitality is active is almost sure to attract blood enough to itself, if there is no utter physical obstacle to the current.

3rdly. Deficiency in the blood of the materials necessary for healthy growth and nutrition of an organ is a third cause. This may be exemplified by the atrophy of bone and muscle when there is an insufficient supply of food, or when the materials necessary for them are wasted by undue secretion : as in *mollities ossium.*

4thly. Deficient vitality;—deficiency of that power by which every organ is enabled to maintain its growth, and to abstract from the blood the materials for its nutrition. This again may be caused by exhaustion;—by excessive fatigue;—by over use or abuse of a part;—by disease, which has spoiled its tissue;—by injuries to the nervous centres or trunks supplying it; and, lastly, it constantly happens that when the vital powers of the whole body are well nigh exhausted by illness, by starvation, or by exposure to cold, one particular organ may be irretrievably blighted, though the remainder may recover their accustomed health. The amaurosis which occurs in anæmic subjects, and the wasting of one leg or arm after fever are instances.

The *treatment* will be exemplified under the heads of atrophy of muscle, and of bone.

V. FATTY DEGENERATION. — One of the most curious points established by modern pathologists is the fact that most tissues in the course of atrophy, are liable to have their proper substance replaced by fat; that substance, of all others in the animal œconomy which differs least from inorganic matter. Fatty degeneration is liable to affect the muscles, and particularly the heart; it may occur in the bones and cartilage; in the liver of the consumptive, the lungs of the emphysematous, and the kidneys of those who die of Bright's disease. It may even affect unnatural as well as natural structure, and is found in the parasitic cells of cancer. It is sometimes, particularly in the aged, attended with a general tendency to obesity; but not always, or of necessity; for examples of fatty degeneration of single organs may be found in bodies which otherwise are extremely emaciated.

VI. SENILE DEGENERATION.—As man is born for a limited term of life, so each separate part of his organism, when it has attained perfection and answered its appointed purposes, begins to show symptoms of decay;—thus giving us warning that death must occur sooner or later from mere inability of the organs any longer to carry on the processes of life, even if it be not hastened by violence or disease. Some of the changes which take place in consequence of age, in the eye, the teeth, the prostate gland, and the bones, are subjects of surgical study, and will be detailed in the fourth part of this work.

It must be added that when we speak of *senile* degeneration, we speak of a thing "not to be measured by number of years;" for some men at fifty are in all respects older and worse in constitution than others who are thirty years their seniors. It must be added, likewise, that some instances of wearing out may occur at quite an early age, as for example the decay of the hair and teeth; and that peculiar change in the veins which is known as varix, when they became distended and knotty from inability to support the column of blood contained in them.

VII. OTHER DEGENERATIONS there are, affecting particular parts more or less exclusively, as the condition of the blood-vessels called nævus. These will be described when we treat of the organs implicated. But with regard to ulceration, gangrene, tubercle, and cancer, and most of the other changes of structure not included in the preceding paragraphs, they are so generally preceded or followed by a great afflux of blood, and by the other phenomena called *inflammatory*, that it is more convenient to consider them as consequences, or as parts of the important process of inflammation.*

CHAPTER II.

OF DISORDERS IN THE DISTRIBUTION OF BLOOD, AND OF NERVOUS PAIN.

I. HYPERÆMIA.—Although preternatural accumulation of blood plays a most important part in that series of phenomena known by the generic term *inflammation*, yet it does not by itself constitute inflammation; and we have devoted this short chapter to the subject of disorders in the circulation *per se*, chiefly in order that the student may be aware that a something above and beyond this is necessary to constitute inflammation, as will be shown in the next chapter.

Local hyperæmia may be of two kinds—1. active, or arterial;—

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* For fuller information on the subjects of this chapter, consult Mr. Paget's Lectures on Nutrition, Hypertrophy, Atrophy, &c. Med. Gaz. N. S. vol. iv. and v.; and Andral's Pathological Anatomy, trans. by West and Townsend.

2. passive or venous. To the first the name *determination of blood*, or *active congestion*, to the second the name *passive congestion*, is commonly given.

1. *Active determination* of blood is a process wherein more blood is attracted to some particular organ, and circulated through it more rapidly than usual. It is necessary to many natural and beneficial actions: as the enlargement of the womb in pregnancy, and of the breasts after delivery. It is equally necessary to many morbid actions; it forms one of the first and most palpable effects of inflammation; it is witnessed in blushing; in the condition of the blood-vessels of the intestines in malignant cholera; in headaches and apoplectic attacks from excitement: and in the immense afflux of blood to the uterus, and consequent hæmorrhage from ovarian excitement.

2. *Passive congestion* signifies a stagnation of blood in a part, especially in its veins. It may be a consequence of mechanical obstacle to the return of blood; or of atony and want of vital contractility in the capillaries, especially if they have been previously subject to great distention or excitement. It is evidenced by a sense of weight and aching pain, and is very liable to lead to serous effusion, and to ulceration or gangrene.

There are two causes of peculiar force in producing local accumulations of blood. One is, mental emotion, the effects of which in directing a torrent of blood to the uterus are well known; whilst it is not less true that the act of fixing the attention strongly on any organ whatever, in either sex, is sufficient to derange its circulation. The other is, impurity of blood. Let the blood be impure from any cause whatever, from the presence of bile, urea, or lithic acid, or even let it be deficient in its proper constituents, and local congestions are sure to occur. The headaches that accompany biliary disorder, and the serous effusions which follow Bright's disease, are examples. The *treatment* of these cases must comprise the purification of the blood: the removal of mental causes; the local abstraction of blood; the application of cold; and in passive cases of stimulants and bandages.

II. NERVOUS PAIN.—As all redness is not inflammation, so neither is all pain. Pain may arise from muscular spasms or cramp, or from some diseased condition of the nerves, or of the nervous centres, without the existence of the least inflammation. Such pain, nervous pain, as it is commonly called, may often be known by its capriciousness; by its coming and going without apparent cause, or with no other cause than the patient's mind being directed to it. It is often intermitting and periodical. It is often relieved by measures that would aggravate inflammation, such as stimulants, pressure, and friction; and almost infallibly aggravated by leeches, blisters, and other remedies that would relieve inflammation if it existed. It is often intense in proportion to the anæmic and debilitated condition of the patient. It is often intense out of all proportion to heat, swelling, and redness, even if they are present at all. It may last for weeks or months without being followed by any of the changes of structure which are commonly called inflammatory. Lastly, it may be felt in parts quite remote from any morbid action, or may be referred to parts of the body destitute of sensation (thus after fracture of the spine severe pain has been felt in the legs, though quite insensible to the touch) or may be referred to parts that have no existence, of which the pain felt in limbs long since amputated may be an example.

The *treatment* of this condition will be found in Part IV., under the head of Neuralgia.

CHAPTER III.

OF THE GENERAL PHENOMENA OF INFLAMMATION.

Definition.—Inflammation may be defined to be a state of altered nutrition, attended with increased vascularity and sensibility, and with a tendency to certain definite changes of structure.

Symptoms.—The symptoms are redness, pain, heat, and swelling, with impaired function of the inflamed part; — and each of these symptoms requires a few observations in detail.

(1.) The *redness* is owing to the increased quantity of blood in the inflamed part; the smallest capillaries being distended with red particles, and rendered visible to the naked eye. When inflammation is acute, the redness is of the bright scarlet tint of arterial blood; when chronic, it is of a darker venous hue; and in certain specific inflammations it is purple or copper-coloured. Again, in common inflammation, it is gradually diffused, and lost in the neighbouring parts, whilst in some forms of specific inflammation[*] it is abruptly circumscribed.

(2.) The *pain* of inflammation may be attributed partly to a stretching of the nerves by the distended blood-vessels, but chiefly to that disorder in the vital actions, be it what it may, in which the essence of inflammation consists. It differs in its character and intensity according to the cause producing it, and the part which is affected. Thus it is burning or tingling in the skin; throbbing in the cellular tissue; sharp and lancinating in the pleura; a mere sense of heat and soreness in the bronchial mucous membrane; and extremely dull and oppressing in a part supplied with ganglionic nerves; as the stomach, kidneys, or testicles. It is always less severe if the fluid products of inflammation can readily escape, than if they are confined;—and comparatively slight if the part inflamed be yielding and extensile, but most severe if it be hard and dense, as bone or ligament; although these structures possess very little sensibility in health. It is sometimes felt at a distance from the inflamed part; thus pain in the shoulder is often the first symptom of inflamed liver, and pain in the knee of diseased hip. Lastly, it may be entirely absent; as when inflammation occurs in a healthy constitution, and merely produces adhesion; so that adhesions are often found between the pleuræ after death, that never were suspected during life;—or when inflammation, although disorganising, is very insidious and indolent, as in scrofula; —or when the patient's mental and physical sensibilities have been benumbed by the habitual use of intoxicating liquors;*—or when the nervous system is stupified by the influence of poisonous blood in fever;—or when the part inflamed is deprived of its nerves of sensation.

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[*] Hunter's Works by Palmer. Vol. iii. p. 330.

(3.) The *heat* of inflammation was supposed by Hunter to be a mere effect of the increased afflux of blood. For it is most remarkable in inflammation of those parts which are farthest from the heart, and naturally the coldest; and in them it often does not rise so high as the mean temperature of the blood;—whilst in inflammation of internal parts, whose heat is uniform, and not depressed by external vicissitudes, it sometimes does not rise at all. We may, however, suppose with Liebig, that, together with the increased afflux of blood, there is also a more rapid oxydation of the tissues of the inflamed part, which will of necessity produce a greater evolution of heat.†

(4.) The *swelling* is caused at first by the increased quantity of blood, and subsequently by the effusion of serum, blood, lymph, and pus. It is most remarkable in loose textures; also in the breast, testicle, and lymphatic glands.

(5.) The *impairment of function* which inflammation produces, consists at first in an increased irritability and morbid sensibility of external impression; but, subsequently, of an utter incapability of performing the usual offices, in consequence of structural change. Secretion is generally diminished at the commencement of inflammation, but the secreted fluids at its close may be apparently increased in quantity, and *mixed* with the products of inflammation—blood, serum, lymph, or pus.

(6.) *Structural changes.*—The characteristic tendency of inflammation is to produce an exudation from the surface of membranes, and into the substance of organs, of a fluid, which assumes the form either of coagulable lymph, or of pus. The history of these effusions will be found in the following chapters.

EFFECTS AND TERMINATIONS.—Inflammation has only one genuine *termination*, namely, *resolution*, or recovery; the inflammatory action subsiding, and the part returning to its former state;—but, beside resolution, it may have either of the following six terminations, or *effects*, or *consequences*, as they ought rather to be called. 1. *Hæmorrhage;* an escape of blood from the distended vessels. 2. *Effusion of serum.* 3. *Effusion of fibrine*, or of *coagulable lymph*, which, when organised, produces *adhesion*. 4. *Suppuration*, the formation of a peculiar fluid called *pus*, closely allied with which is the change called *ramollissement*, or softening. 5. *Ulceration;* the destruction of the inflamed part by a process of gradual disintegration. 6. *Mortification*, or its death. To each of these effects a chapter will be devoted, but we may observe here that effusion of fibrine and suppuration are the only definite and characteristic effects of inflammation; the others may all be produced by other causes besides.

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* Latham, Lectures on Subjects connected with Clinical Medicine.—Lect. iv.

† James on Inflammation, p. 239: Macartney, on Inflammation, p. 14; Latour, Revue Méd., Jan. 1840; Liebig, op. cit. p. 254.

MORBID ANATOMY.—The ordinary *post mortem* appearances of recent inflammation are, redness, softening, swelling, and infiltration with serum. It is necessary, however, to observe that redness may, in the *first* place, disappear altogether after death—*secondly*, it may be simulated by redness from congestion which existed during life—and *thirdly*, it may be simulated by certain appearances produced after death, through the gravitation of the blood to the most depending situations, and through the transudation of the serum and colouring matter through the coats of the vessels in incipient putrefaction; which are frequent causes of red spots and stains on internal surfaces, and of collections of bloody serum in the various cavities. Therefore, redness, swelling, softening, and serous effusion must not be hastily received as evidence of inflammation, unless accompanied by some more decided effect, such as lymph or pus.

FORMS OF INFLAMMATION. — Inflammation may be divided — 1. Into *healthy* and *unhealthy*,—the former being that which naturally ensues in healthy constitutions, when a part of the organisation is impaired; being restorative in its tendencies, injurious only if excessive or misplaced, and usually concentrated towards one point: whereas the unhealthy is essentially destructive, has little or no spontaneous tendency to recovery, and is liable to be diffused widely.* 2. Into *common* and *specific;* the common arising from ordinary causes acting on healthy constitutions;—the specific arising either because the constitution is unsound, as in scrofulous, gouty, or rheumatic persons, so that (to use Hunter's words) it gives or reflects back upon the part inflamed a diseased disposition or action;—or because it is produced by a cause which is specific; as the poisons of small-pox or syphilis. 3. It may be divided into *acute* and *chronic;* the acute being sudden in its seizure, violent in its action, and rapid in its progress;—the chronic being less violent and more tardy. Acute inflammation is sometimes called *active;* and the term *passive* is applied to chronic inflammations in weak constitutions. 4. It may be classified according to its tendency to produce particular local effects; thus we speak of adhesive, suppurative, hæmorrhagic, ulcerative, and gangrenous inflammation. 5. The tendency to particular forms of inflammation is greatly influenced by the *structure of the parts* which it invades; for it has a greater tendency to produce certain effects in some structures than in others. In parts which have no natural outlet, it is more disposed to produce adhesion than suppuration. But in the mucous membranes, it tends to produce suppuration before adhesion: because suppuration is but a trifling evil compared with the danger that would ensue if the mucous canals were closed by adhesive matter, from the slight inflammations to which they are perpetually subject.* Yet serous cavities may suppurate; and mucous membranes be covered with an exudation of lymph; as in croup, diarrhœa tubularis, and dysmenorhœa.

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* When we speak of *healthy* inflammation, we use an apparently self-contradictory term; but still one that is commonly understood to imply an inflammation whose natural tendency is to recovery.

Predisposing Causes.—The predisposing causes of inflammation may be constitutional or local. The constitutional predisposing causes, are plethora, the sanguine temperament, excess in food drink and bodily exertion; exposure to noxious miasmata; and disorder of the liver, kidneys, skin, and other organs whose office it is to purify the blood. When inflammation arises from these causes alone, it is said to be spontaneous or idiopathic, or constitutional. The local predisposing causes are chiefly over-stimulation or exertion beyond power; besides previous disease, and original weakness of organization.

Exciting Causes.—The exciting causes may be divided into two classes. 1. Those which act primarily on the *structure* of a part,—as mechanical and chemical injuries of all sorts. 2. Those which act primarily on its *functions* and *vital endowments*,—as over-exertion;—and such poisons as cantharides, which affect living matters only. The former class act *directly;* that is, they inflame the part which they are applied to: the latter class may act *indirectly;* just as cold applied to the feet causes inflammation of the lungs. The former also act *immediately;* whilst some of the latter may take some time (which is called the stage of incubation) to produce their effects. Lastly, causes may be *common* or *specific;*—the former being those which are daily met with, and which can act on all constitutions;—the latter being unable to affect all constitutions, being peculiar in their origin, and producing a modified inflammation, with a specific train of consequences. The vaccine virus may be an example.

Theory of Inflammation.—It is not compatible with the scope of this work to give a detailed account of the various theories that have been invented respecting the *proximate cause* or *essential nature* of inflammation. Of the older writers, some attributed it to a *lentor* or viscidity of the blood;—others to an *error loci*, that is, an obstruction of the capillaries by the entrance of globules too large to pass through them. Cullen supposed that it consisted in spasm of the extreme vessels. Hunter ascribed it to an increased action;—Wilson Philip and Hastings to a debility;—Henlé to a paralysis; and Mr. J. W. Earle to an obstruction of the capillaries.

In assenting to these theories it was of course taken for granted that the capillaries are the *essential seat* of inflammation, and that it is to some *action* or *condition* of them that the phenomena of inflammation are due.

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* See John Hunter's observations on Erysipelatous Inflammation. In Palmer's Edition of his works, vol. iii.

But Dr. Macartney showed clearly that it could not be the blood-vessels which were the parts originally affected, and proposed a theory that *a sense of injury felt by the organic nerves* is the *point de départ* in inflammation; a theory not without its practical results, since it is very certain that inflammation after an injury may be prevented or mitigated by measures calculated to soothe and allay all sense of irritation.

The next step arrived at was the conviction as stated by Mr. Travers,* that inflammation was not a disorder in any one element of the tissues alone; neither in the blood, blood-vessels, nerves, nor lymphatics; nor yet that it was a change purely physical, or chemical, or nervous; but that the tissues are involved as a living whole, and all their properties simultaneously.

So Liebig's theory, that in inflammation there is an unnaturally rapid oxydation of the inflamed tissues, is no doubt true, although not the whole truth.

If we consider for a moment the relation which the living tissues and the blood-vessels have to each other in health, we shall acquire a more just idea of the share which they take respectively in inflammation. The blood-vessels are but *carriers*. The arteries bring oxygen to excite the different functions, and to dissolve and destroy tissues that have played their part and are become effete; they also bring new material, which the tissues attract out of the capillaries, and employ by means of their vital forces for their cure, reparation, and increase; and the veins carry away effete and superfluous matters. But they do no more; they are not, as it has been the custom to term them, the *agents of organization*, the *builders of the tissues*; for in the fœtus much of organization is accomplished before blood-vessels are formed at all; and there are many tissues in the adult, such as the cornea and vitreous humour, which have no vessels, but nourish themselves, and carry on the processes of inflammation by means of the fluids which they attract from the vessels in their vicinity.

Wherever in health the vital forces are most active, there most blood is conveyed. When the womb or breasts enlarge in pregnancy, their vessels become infinitely more voluminous; but the enlargement of the womb is not the consequence of the dilatation of the blood-vessels, but the cause of it; more blood is demanded there, more blood is brought, and the arteries enlarge in obedience to the wants of the part they supply.

If we apply these views to explain the essential nature of inflammation, we shall be compelled to admit that its seat is—not mere vessel or nerve—but the entire living tissue. That the tissue, which in its normal condition, attracts out of the neighbouring blood-vessels the necessary materials for its own life and growth, if its vitality be interfered with—by injury, by poison, by heat or cold, or any other source of disease—sets up another series of actions, of which the attraction of considerable quantities of arterial blood is one of the most conspicuous, and which in their totality constitute *inflammation.*

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* Travers on Inflammation, 1844, p. 26. This work contains copious and accurate accounts of microscopical observations on inflammation excited in frogs, &c.

That, under favourable circumstances, if for instance there is a physical breach of continuity to be repaired, the tissue attracts from the vessels some of the liquor sanguinis, which forms a *blastema*,* or plastic material, out of which a new living tissue is developed, by which the injury is repaired. The adhesion of a wound and reparation of a simple fracture are familiar instances.

That, under less favourable circumstances, whether arising from the amount of injury inflicted, or from the want of proper vital power in the liquor sanguinis, a series of further changes ensues. The plasma attracted from the blood-vessels begets within itself a kind of cell—incapable of further life or development—which is well known as the *pus-corpuscle.*

That, under still more unfavourable circumstances, the tissues, after a violent struggle, perish and mortify.

That, under certain unhealthy conditions, the liquor sanguinis, whether that supplied for the common purposes of nutrition, or that supplied in greater quantity through a slight degree of inflammation, begets various morbid cells, such as those of cancer, tubercle, &c.

We are thus compelled to take from the capillaries the office which has been so long assigned to them as the *factors* of inflammation. But yet a great afflux of arterial blood is a most important instrument in the changes which inflammation produces, and the prevention of it is one of the most efficient means for controlling those changes. And there is little doubt but that the lax state of the blood-vessels in a chronically inflamed part is often one great obstacle to a perfect recovery.

We are further compelled to deny the various theories which take a distended state of the capillaries as their basis, and account for the various effects of inflammation as so many mechanical consequences of that distension. Thus it has been common to say that serum exudes from the blood-vessels in the first stage, when but slightly distended; that, under the influence of greater distension, the *liquor sanguinis* is forced out; that if the inflammation still progress, blood will be extravasated, &c.

But, granting that when the vessels are much distended, serum will exude from them, and that if they are further distended they may be ruptured and give exit to blood, yet this theory is quite insufficient to account for the effusion of liquor sanguinis or of lymph. In inflammation of serous membranes for instance, "the blood-vessels are all on one side of the membrane, and yet the serum and lymph are on the other."* If the lymph were merely effused mechanically from distended capillaries, it ought to be found where the capillaries are — in the subserous cellular tissue; its being found where it is, can only be accounted for on the theory we have been labouring to prove, viz., that it is attracted out of the capillaries by the cells on the *free surface* of the serous membrane.

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* Βλάστημα, *germen; βλαστάνω, germino, pullulo.*

Microscopical Observations.—Many attempts have been made to ascertain the exact processes which take place in an inflamed part, by means of microscopical observations on the transparent membranes of animals such as the mesentery of the rabbit, and web of the frog's foot, after inflammation had been excited in them by mechanical or chemical injuries;—and many very erroneous theories have been built upon the results of these observations. But from some recent and most careful observations made by Mr. Paget on the web of the bat's wing, we may gather the following particulars, which may be very rationally applied to explain some of the phenomena of disease.

The primary effect of a slight stimulus applied to the blood-vessels, is a slight and temporary contraction, with a retardation of the current through them, followed by an expansion of the vessels and acceleration of their current. If the point of a fine needle be drawn across a minute artery and vein, three or four times, without injuring them, or the membrane covering them, they will both presently gradually contract and close. This contraction is no doubt analogous to the speedy closure of the innumerable small vessels divided in a wound, which are made to contract by the very stimulus of the instrument which has divided them.

During this contraction, the blood moves more slowly, or perhaps does not move at all. But when the vessels dilate again, they acquire a larger size than they originally had, and the blood moves more freely and rapidly through them than it did before. And now the same stimulus that made them contract at first, has no effect, or a very transient one; a more powerful stimulus, however, may make them again contract and close.

On applying a more powerful irritant, such as a drop of tincture of capsicum, the preliminary contraction, if it occur at all, is so transient as to be hardly perceptible, but the phenomena of active congestion or determination of blood become instantly developed. The blood-vessels become rapidly dilated, lengthened, and tortuous; sometimes even they display varicose or aneurismal excrescences; they are tensely filled with blood, containing a large excess of red globules, which is circulated with far greater velocity than is natural.

But if the injury inflicted be of still greater severity, as a wound with a red-hot needle, then in addition to the preceding state of active congestion, there follows in the very focus of the morbid changes, a retardation, and at last, a complete stagnation of the blood in the densely crowded capillaries. "All round this focus the vessels are as full, or nearly as full, as they are in it; but the blood moves in them with a quicker stream, or may pulsate in the arteries, and oscillate in the veins; yet further from this focus, the blood moves rapidly through turgid but less full vessels." The dusky colour in the centre of a phlegmon; the throbbing; the red blush around; the gush of blood on cutting into it, are thus fully explained.

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* Vide Goodsir's Anatomical and Pathological observations. Edinburgh, 1845.

After this, the liquor sanguinis begins to be exuded into the interstices of the tissues. Or perhaps the blood-vessels are ruptured and a small quantity of blood becomes extravasated (*hæmorrhage*). If the inflammation continue, the tissues become completely broken down and disorganized at the points where the inflammation is most intense, and pus is there formed out of the exuded lymph (*suppuration*). If the inflammation increases in severity, the stagnant blood coagulates in the vessels, the tissue becomes soft and flaccid, and in fact *mortifies.*[*]

CHAPTER IV.

OF ACUTE INFLAMMATION.

DEFINITION.—Acute inflammation is that which is sudden in its origin, violent in its action, and rapid in terminating; and it is attended with fever, either if it be considerable in its extent, or if it affect parts of great sensibility and importance, or if the constitution be highly irritable.

TREATMENT.—In the treatment of acute inflammation and its attendant fever, the *indications* are, to reduce the increased action of the heart and arteries, and diminish the quantity of arterial blood sent to the inflamed part; to allay pain, nervous excitement, and disturbance of vitality in the inflamed part; to purify the blood, and to remove all causes. The chief means are, evacuants, sedatives, and narcotics.

(1.) BLOOD-LETTING, *Objects of.*—The first and most important measure is general blood-letting;—which, if carried far enough, induces a state of insensibility and suspended circulation, to which the

[*] Vide Cullen's First Lines, book ii. chap. i. sect. 2; Thompson's Lectures on Inflammation; Gendrin, Histoire Anatomique des Inflammations; Andral, Anatomie Pathologique; Wilson Philip's Treatise on Fevers, and Experimental Inquiry into the Laws of the Vital Functions, 3rd ed.; Mayo's Outlines of Physiology, 5th ed.; the Papers by Mr. J. W. Earle in Lond. Med. Gaz. vol. xvi.; Gulliver Phil. Mag., Sept. 1838; Kaltenbrunner de Statu Vasorum et Sanguinis in Inflammatione, 1826; the Lecture on Inflammation in Graves's Clinical Medicine; T. Wharton Jones in Brit. and For. Med. Rev., Oct. 1842; J. Hughes Bennett, Lond. and Edin. Jour. Med. Sc., Dec. 1842; Treatise on Inflammation, Edinburgh, 1844; and Paget's Lectures, Med. Gaz., June 1850.

name *syncope*, or *fainting*, is given. Now it requires to be understood, that this suspension of the heart's action depends upon two causes; *first*, on the abstraction of its natural stimulus, the blood;—*secondly*, and principally, on a peculiar sedative influence transmitted to it from the brain, when the latter does not receive its due share of arterial blood. And although the mere loss of blood *per se* may be of service (when that fluid is morbidly abundant) by relieving the system from a source of excitement, still the principal good effects of bleeding in inflammation depend on its sedative effects on the brain, and through the brain on the heart. And as it is often absolutely necessary to bleed persons in acute diseases who are extremely debilitated, it is of importance to produce as much of that sedative effect with as little loss of blood as possible.

Manner of Bleeding.—For this purpose the blood should be drawn as quickly as possible, from a large orifice; and, above all, the patient should sit or stand upright. For if the blood is drawn slowly, so that the vessels have time to adapt themselves to their diminished contents, or if the patient is in the recumbent posture, so as to assist the flow of blood to the brain, the bleeding may be continued almost to death without the occurrence of faintness.

Quantity to be taken.—As a general rule, the blood should be permitted to flow till paleness of the lips, lividity about the eyes, sighing, nausea, fluttering pulse, and relief of the pain, indicate the *approach* of syncope; but *full* syncope should always be avoided.

Tolerance.—The tolerance, or power of bearing bleeding without fainting, varies according to the age, sex, and temperament of the patient, and to the *epidemic constitution*, or prevailing nature of disease. Thus in one period of years, diseases have an active sthenic character; they require bleeding, and bear it well. In other periods of years, of which the years 1847–50, are examples, disease of all kinds has a low asthenic character, and bleeding is not required and not tolerated. The tolerance is less generally in the very young and old than in the middle-aged;—less in the female than in the male;—and less in the nervous and lymphatic temperaments than in the sanguine and phlegmatic. It is besides affected most remarkably by the existing disease. Thus it has been ascertained by Dr. Marshall Hall, that 15 oz. is the average quantity that will produce syncope in a healthy adult if bled whilst standing upright; but that in some diseases much more requires to be taken, and in others much less.

The diseases in which bleeding is best borne, are inflammations of the head, or of other vital parts. Those in which it is most injurious and worst borne, are putrid fevers and diseases of debility. And so, an observation of the tolerance is sometimes a very important aid to diagnosis. Supposing a woman to complain of violent pain in the head or abdomen, which is suspected to be inflammatory; if faintness occurs from the loss of a very small quantity of blood, it will be certain either that it is not inflammatory, but nervous;—or that, if inflammatory, it must be treated by other measures than blood-letting. But the junior practitioner must bear in mind that he may occasionally meet with some thin, bloodless patients, whom it would be very injurious to bleed, but who nevertheless, from some peculiarity of constitution, do not faint, even though bled to excess.

Reaction.—After the depressing effects of bleeding there naturally ensues a degree of reaction; the pulse rising in frequency, and the local pain returning; and this reaction will be the greater if the venesection has been carried to the extent of producing full syncope;—hence the importance of stopping short of this point. This reaction is, if possible, to be prevented by the sedatives, which we shall mention presently; but if, notwithstanding, well-marked inflammatory symptoms return, the bleeding must be repeated,—provided that the strength permit.

Indications for Bleeding.—But as venesection is not to be resorted to indiscriminately in every case of acute inflammation, a few words must be added on the principles that regulate its employment. And there are three things to be considered; viz. 1st, the patient's strength, and state of constitution; 2ndly, the part affected; 3rdly, the nature and amount of the injury or exciting cause which has produced the disease.

(1.) With regard to the state of the constitution: bleeding is most required, and best borne, when the *temperament* is sanguine, or that mixture of the sanguine and phlegmatic termed rustic;—when the muscles are large and firm;—when the blood-making powers are vigorous and the circulation strong, as indicated by redness of the face and lips, and by a full, hard, and frequent pulse. On the other hand, it will be borne worse when the muscles are large and flabby, and the pulse habitually open, soft, and full. And it will be borne worst of all when the complexion is sickly and pale,—the pulse quick, small, and feeble,—the lips, conjunctiva, and tongue pale. And if there should happen to be a state of passive dilatation and weakness of the heart, syncope would most likely be instantly fatal;—and if there should be any organic disease which impedes the formation of blood, its loss is liable to be followed by irrecoverable sinking and exhaustion. *Fat people* generally bear bleeding worse, and in fact contain less blood, in proportion to their bulk, than those of a spare, lean habit and rigid fibre.

The propriety of a *second bleeding* must in a great measure be determined by the effect which the first has had on the pulse; for if that be more frequent and quick, or more sharp and jerking, instead of slower and softer, it would seem that the bleeding had diminished the strength more than it had reduced the disease. The state of the blood must also be regarded; for if the surface of the coagulum be flat, and its consistence loose, it is a sign that the vital powers are depressed; that further bleeding will be injurious; and that the case must be committed to the other antiphlogistic powers.

(2.) Respecting the *part affected*, it may be observed, that the necessity for venesection, and its beneficial effects, will be greater in proportion as the *tolerance* is greater,—and that it may be indispensable if the organ affected is important to life, or to its enjoyment; whilst it might not be so if an equal degree of inflammation affected an unimportant part,—and that its good influence in inflammation of a vital organ will often be marked by a rise in the strength and fulness of the pulse.

(3.) With regard to the *nature of the cause:* bleeding is not well borne when that is such as to produce great depression of the vital powers, as in the case of dissection wounds:—nor when the inflammation itself causes great depression, as in phlebitis;—nor in the case of an injury requiring great constitutional efforts for its restoration, as a compound fracture;—nor if the disease be advanced towards suppuration or gangrene.

II. Purgatives.—In all cases of acute inflammation, except those in which the action of the medicine would disturb the diseased or injured part (as in wounds of the alimentary canal) the abdominal veins should be drained and the blood purified by efficient purgatives, such as gr. v—x of calomel at bed time, followed by F. 33, 34, or 35, &c. in the early morning, and repeated night after night till tarry, dark, offensive motions cease to come away; pausing, however, if the patient is much griped, or if scalding stools of clear mucus or blood, with tenesmus are produced. F. 40 is a truly wonderful agent for lowering the pulse, and relieving acute inflammation.

III. Direct Antiphlogistics. — Such, for want of a better name, we must call mercury and antimony, from their effects in abating inflammation when the system is impregnated with them. (*a*) *Mercury* is chiefly advantageous in idiopathic inflammations of serous structures, with a tendency to adhesion; such as iritis and peritonitis. But when the nature of the disease and state of the pulse demand blood-letting, mercury cannot be regarded as a substitute, but only as an auxiliary; and, if employed to the neglect of bleeding, will most likely do more harm than good.* The best form for its administration is calomel, of which from one to five grains may be given, at intervals of from two to six hours, till a *slight* affection of the mouth is manifested, which should be kept up by smaller doses if necessary; but all violent salivation is an evil. The calomel should be combined with opium F. 62, to prevent it from purging. (*b*) *Tartar Emetic* is another direct antiphlogistic; it may be administered in doses of $\frac{1}{8}$-$\frac{1}{2}$ grain, with each dose of calomel and opium, or may be given by itself after the manner detailed in the Appendix F. 67.

IV. Diuretics and Diaphoretics.—(*a*) *Colchicum* is a remedy most useful in gouty and rheumatic affections. It seems to have the power of freeing the system from excess of lithic acid. (*b*) *Nitre* and the other salines, as in F. 58, may also be given with great advantage; they abate heat and thirst, purify the blood, and increase the secretion of urine.

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* Vide *Art.* Calomel by the Author, in the Cycl. Pract. Surgery.

V. NARCOTICS.—*Opium* is a most valuable remedy against the nervous element in inflammation, as well as in enabling the patient to bear up under its effects. But as it primarily decreases the secretions, and increases vascular excitement, it must not be given in acute inflammation till after bleeding; but then a large dose (such as gr. ii.) may be given in combination with five of calomel, to allay pain and prevent reaction. But it is the *sine quâ non*, and may be given without reserve in inflammations occurring in very debilitated habits, such as peritoneal inflammations from perforation of the intestine after fever; or acute inflammation occurring after profuse hæmorrhage.

The warm bath acts in every way analogously to opium, and requires the same precautions; viz. as it stimulates before it soothes, it must be preceded by evacuations, if the habit be plethoric. The proper temperature is 97° Fahrenheit, and it should be continued long enough to induce a complete relaxation.

VI. SEDATIVES.—Hyoscyamus, conium, and digitalis, are of eminent service, when combined with calomel and antimony (F. 62), to prevent reaction, and soothe pain in inflammatory cases attended with great nervous irritability.

VII. DIET.—The diet in acute inflammation should, as a general rule, be of the least stimulating nature. But although water-gruel and tea might for many days suffice for the robust and plethoric, the starving system must not be indiscriminately applied to children, or the old or debilitated; on the contrary, their strength must be supported by mild fluid nutriment, milk, arrowroot, veal and chicken broth, &c., and even by wine if necessary.

VIII. REGIMEN.—There must be a total avoidance of everything that would irritate mind or body. Perfect rest in the recumbent posture, and in a position as easy as it can be made,—cool air,—free ventilation,—the exclusion of light and sound,—with mental consolation, to allay doubts and fears, and inspire resignation and cheerfulness, are most potent aids to medical treatment, which without them would often be utterly fruitless.*

LOCAL TREATMENT.—In the local treatment of inflammation, the first thing to be done is to remove all exciting causes if possible, and to place the part at perfect rest, and in an elevated posture, so as to favour the return of blood from it;—and then the indications are, to diminish the morbid heat and afflux of blood, and to allay irritation and pain.

1. The *local means of abstracting blood* are leeches, cupping, and scarifications. In order to apply leeches, the part should first be washed, and if they will not stick, a little milk or blood should be smeared on it, or some small punctures should be made with the point

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* A most instructive commentary on the value of antiphlogistic remedies of various kinds, is to be found in Dr. Latham's second series of Lectures on subjects connected with clinical medicine.

of a lancet; and the leeches should be well dried in a cloth. The best plan of stopping hæmorrhage from leech-bites is to dip small pellets of lint in the tinct. ferri sesquichloridi, and press them on the holes for a few minutes. Other plans are to insert a finely pointed pencil of lunar caustic into them, to touch them with a red hot knitting needle, or to stitch them up with a very fine needle and silk, or to apply a small piece of *matico* leaf. But in order to prevent the very serious consequences that sometimes happen from this source to children and delicate persons, directions should always be given that the bleeding from leech-bites should be stopped before the patient is left for the night. Moreover it will be prudent to apply them over some bone, so that the pressure may be applied effectually. Again, leeches, if they stick too long, should be removed by touching them with salt, and should not be pulled off forcibly; nor should they be applied to the eyelids or prepuce, otherwise they will probably be followed by œdematous swelling. *Cupping*, when it can be adopted, is a more active measure, and relieves pain sooner than leeches. *Punctures* are of use in superficial inflammations of the skin; *incisions* are of use when inflamed parts are covered with a dense unyielding fascia, as in whitlow; or when there is great tension, as in phlegmonous erysipelas; or when the inflamed part is infiltrated with an irritating fluid, as in extravasation of urine, or with unhealthy matter, as in carbuncle.

2. *Cold applications* are of use to diminish heat, and cause contraction of the capillaries; but they should be applied continuously, otherwise the pain will be aggravated when the heat returns. They should be applied by means of a single piece of thin linen frequently changed; and care should be taken that the vapour may pass off freely, otherwise the cold lotion will soon be converted into a hot fomentation. In some severe cases, ice or frigorific mixtures (F. 114) may be applied in bladders. The following very effectual means of applying a continuous degree of cold is recommended by Dr. Macartney. The inflamed limb is to be placed in a trough or piece of oilcloth, with a piece of lint on the inflamed part. A large vessel full of cold water being then placed on a table by the bedside, one end of a broad strip of cloth should be dipped in the water, and the other end (which should be cut to a point) laid on the lint; and so the water will be carried in a constant gentle stream down the cloth to the inflamed part.

3. *Warmth.* Very often cold adds to irritation, and perhaps in most cases *tepid* applications (85° Fah.) are the best; for they do not stimulate like heat, nor occasion painful reaction like cold, and are more directly sedative than either. *Warm* fomentations (92°—98° Fah.) are useful by relaxing the skin, soothing pain, and promoting perspiration, and are especially indicated in inflammations of dense tendinous parts. But in every case the patient's feelings should be consulted, and the application be warm or cold according to his choice. Dr. Macartney very justly insists on the necessity of producing an agreeable state of feeling in inflamed parts, as a means of relieving

that sense of irritation in the organic nerves which he considers as the *point de départ* in inflammation. He has contrived an apparatus for conveying steam to any part of the body, which affords an excellent means of applying heat and moisture. It consists of a tube of woollen cloth, three feet long, twelve inches wide, and fitted with hoops of whalebone to keep it open ; one end of it is applied to the part which it is desired to foment, the other is tied round the neck of a tin boiler in which the steam is generated.

4. *Stimulants*, and astringent solutions, are of great service in inflammation of mucous membranes, by decomposing and washing away their irritating secretions, and inducing contraction of the capillaries.

5. *Counter-irritants.* Blisters are the best form of counter-irritants in recent inflammation ; but they should never be applied too near the seat of an acute disease, and never till its activity has been subdued by previous antiphlogistic measures.

CHAPTER V.

OF CHRONIC INFLAMMATION.

Definition.—Inflammation is said to be chronic when it is slow in its progress, and tends to last long, or even indefinitely.

Causes.—Its causes may be local or constitutional. Thus it may in the healthiest subjects be caused by any slight and continued irritant ;—or it may be the sequel of acute inflammation, the vessels being left dilated, weak, and irritable. But more frequently it is the local manifestation of some constitutional disorder, such as general debility, with a tendency to local congestion,—or over-stimulation and plethora,—or disorder of some important organ, as of the stomach or liver,—or impurity of the blood.

Treatment.—The indications are, to remove all constitutional disorder, to allay local irritation, and to restore the tone of the distended vessels.

Constitutional Treatment. On this part of the subject, our space forbids us to do more than make a few remarks on the most obvious forms of constitutional derangement, which accompany chronic inflammation, and on the remedies that are known by experience to be most useful as alteratives.

(1.) If the patient is bloated and plethoric, with red lips and conjunctiva, and a full hard pulse, and indulges freely in stimulating food and drink, and has unimpaired digestive organs, so that blood is constantly formed in too great abundance, the diet must be lowered and restricted chiefly to fish and vegetables ; free exercise should be taken in the air ; the bowels should be actively purged with calomel and black draught ; and then a course of alterative medicine should be commenced in order to increase the secretions, and relieve the system of its superabundant material. Mercury, given in small doses at bedtime, with saline aperients in the morning, deserves to be mentioned first: Plummer's pill, in doses of gr. v. every night, is an excellent form: but in severe and obstinate cases it may be necessary to administer larger doses of the mercury so as to bring the system fully under its influence; taking care however to desist at the least appearance of ptyalism, and maintain a gentle and continued, but not violent action. Next to mercury, tartar emetic, given in very small doses three or four times daily, F. 67, is most deserving of notice; it is highly advantageous to combine it with mercury, F. 68.

(2.) But if the chronic inflammation occur in an enfeebled and irritable constitution (as when it succeeds an acute attack that has been too actively treated by bleeding and mercury), a nutritious and liberal diet must be adopted, wine and tonics (F. 1, 2, 3, 9, &c.) should be administered in order to improve the digestion and vigour of the circulation; irritation and pain must be allayed by sedatives and opiates; and the secretions of the bowels be maintained by the gentlest laxatives.

(3.) If the tongue is furred and red at its tip and edges, and there are heartburn, flatulence, pain at the chest after meals, and other signs of a weak and irritated stomach, the diet should consist of the plainest and most easily digestible articles; and small doses of alkalis (F. 77, 79) may be given after meals, whilst some tonic is given before them; and the bowels may be kept open by the compound rhubarb pill.

(4.) If the complexion and eye are sallow, and the stools clay-coloured, a few doses of calomel or blue pill, at night, or F. 63, with morning aperients, and the nitro-muriatic acid, F. 22, are indicated.

(5.) In all cases the condition of the urine should be inspected, to ascertain whether albumen, or blood discs,—indications of congestion or degeneration of the kidneys,—are present. In such cases, and in all others in which the skin is dry and harsh, it should be stimulated by exercise, by warm clothing, especially flannel, by the flesh brush or horse-hair gloves, and by an occasional ten minutes' immersion in the hot bath; 92°—98° Fah.

(6.) In females the uterine system must be regulated by the exhibition of steel, aloes, galbanum, or other emmenagogues, if necessary.

(7.) In any case of intractable and unaccountable chronic inflammation, the surgeon should inquire whether the patient has ever had an attack of *gout*, or whether his immediate ancestors were subject to that malady, and especially whether he ever before suffered from any anomalous affections, which were relieved on the appearance of a fit of the gout. For there are very few obstinate chronic inflammations that may not be caused by gout lurking in the system; especially eruptions of the skin; inflammation of the eyes, or of the fauces; incessant tickling cough; irritation of the kidneys; irritable bladder;

pains in the testicle, subacute attacks of orchitis, and inflammation of the urethra with discharge. In any such case attention should be paid to the quality of the urine, to ascertain whether more than the normal quantity of lithic acid is excreted, or less ; the latter condition being by far the more pernicious of the two. In either case, benefit may be derived from the cautious use of colchicum, F. 69, &c., and in cases in which the urine is unusually clear and of low specific gravity, anomalous symptoms often disappear magically on the appearance of a red deposit in the urine. But in treating the gouty diathesis, great regard must be paid to the blood-making powers of the patient, and the surgeon must not fall into the vulgar error that starvation and vegetable diet are the best preventives.* On the contrary, whilst the liver and kidneys are being solicited to execute their functions, by mercury, colchicum, alkalis, guiacum, iodide of potassium, &c., F. 65, 72, 94, 96, 55, &c., it is often necessary to support the strength and invigorate the digestive organs by bitters, and especially by the mineral tonics, F. 9, 11, 13, 15, &c.

(8.) Of chronic inflammations of *rheumatic* origin, the general theory of treatment is the same as of the gouty.

(9.) Of the alteratives that are most useful in dispelling chronic inflammation, we have already mentioned mercury and antimony ; next to these in importance is the iodide of potassium, F. 94, 95, in combination with tonics, sedatives, alkalis, iodine or steel, as circumstances may direct. Its powers of unloading congestion, allaying irritability, and restoring secretion, no one can doubt. Alkalis, especially the liq. potassæ, F. 78, are of great service in full-blooded people, with scanty red urine : the best rule which we can give is, that they will most likely be useful if the face is flushed after meals. On the value of sarsaparilla we shall speak when treating of scrofula. Serpentaria and senega are of great service in chronic inflammation of mucous membranes. Small doses of corrosive sublimate in tincture of bark, F. 87, and the liquor arsenicalis, F. 97, are also useful in certain chronic inflammations, especially of the skin and mucous membranes. In many of these the real evil seems to be a want of vigour, through which the tissues in question seem unable to maintain their vitality. It is on this principle that mineral tonics, as arsenic, zinc, and copper, and the mineral acids seem to do good, by giving a better quality to the materials assimilated.

LOCAL TREATMENT.—This has for its objects, to remove exciting causes, to unload the distended vessels and make them contract to their natural calibre, and to exercise the part in its proper functions, so that it may gradually resume the actions and sensations of health.

Local bleeding must be employed at intervals to unload the vessels, whilst they must be excited to contract by various stimulants and astringents ; such as the sulphates of zinc, copper, and alumina, nitrate of silver, salts of mercury, &c. The application of cold by pumping is often highly serviceable. These or any other measures will be known to do good if they make the part feel stronger and more comfortable, although their first application may have been painful; but if they render it hotter and permanently painful, it is a sign that they stimulate too highly, and may thus endanger the production of acute inflammation.

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* Vide Todd, on Gout and Rheumatism, Lond. 1843.

Counter-irritants are more useful in chronic inflammation than in the acute, especially those which establish a permanent suppurative discharge.

Pressure, if gentle, equal, and continuous, is of material use in many chronic inflammations, and even in acute inflammation of the breast and testicle, when its first violence has been diminished by bleeding.

CHAPTER VI.

OF EFFUSION OF SERUM AND ŒDEMA.

General Description.—Effusion of serum is the earliest and most constant effect of inflammation, the liquid being poured out equally into the interstitial cellular tissue,—into the parenchyma of organs—from mucous and serous surfaces, and from the skin. If it is followed by any of the other effects of inflammation, it is always more widely extended than they are. But it may be the chief or only effect of inflammation, as in œdema glottidis, and the so-called acute hydrocephalus; and some subacute inflammations of the serous membranes. In patients of a lax, flabby habit of body, and in parts of loose and cellular structure, as the prepuce, eyelids, and scrotum, inflammation always produces more of this effect than in those of a firmer texture.

The serous liquid effused in consequence of inflammation, is not, as Mr. Paget observes, the merely albuminous liquid which is commonly known by that name, and which is exuded in passive dropsy, but is in reality liquor sanguinis, and contains a variable quantity of fibrine; as may be readily proved by the spontaneous coagulation which takes place in the so-called serum exhaled from the skin under a blister of cantharides. It is difficult to explain why the effusion remains within the body, as it may for many days and even weeks, without the fibrine separating and becoming solid.

The so called inflammatory serous effusion may terminate in four ways:—1st. It usually becomes quickly absorbed; an event, which is hastened by such purgatives and diuretics and tonics, as tend to drain the blood of impure materials, and give vigour to the circulation, and by bandages and other means of local stimulation. 2ndly, In some cases it resists absorption for a long period, or altogether; of which hydrocele, some cases of hydrothorax, hydrarcthus, and hydrocephalus, afford examples. 3rdly, The fibrine may slowly separate from the serum and solidify, causing a doughy indolent thickening of the cellular tissue, the treatment of which will be mentioned at the end of the next chapter. 4thly, The serum effused may distend the cellular tissue, so as to interfere with the nutrition of the skin; which may be remedied by making punctures with a needle, and allowing it to ooze gradually out. Of the manner in which serous effusion may prove fatal to life, in the œdema glottidis, and hydrocephalus, it is not our purport to speak at present.

Œdema is the name given to the swelling caused by the presence of serum, whether inflammatory or dropsical, in the cellular tissue. It is a soft, inelastic, diffused swelling, which *pits on pressure*, that is, retains for a time the pit or mark made by the pressure of the finger. If œdematous limbs become inflamed from any cause, they are exceedingly liable to ulcerate or slough.

The causes of dropsical œdema, which most concern the surgeon, are the pressure of cancerous, aneurismal, and other tumours on the great veins of a limb, and obstruction of the veins by phlebtis. A raised position, moderate support by bandages, and punctures made with a common sewing needle, to let the serum exude, are the most rational palliative measures.

CHAPTER VII.

OF HÆMORRHAGE.

Hæmorrhage, like serous effusion, may be a consequence, 1stly, of inflammation or excitement; 2ndly, of obstruction to the return of venous blood; and 3rdly, of structural weakness of the blood-vessels and thinness of the blood, as in scurvy and putrid fevers. The first form is called *active*, the last two *passive*.

(1.) *Active hæmorrhage* consists in an escape of arterial blood from the capillaries, when ruptured by the distention caused by acute inflammation or violent excitement; and more or less of it doubtless occurs in every case of violent inflammation. It occurs during the formation of abscess in the cellular tissue and in the liver. But the most common seat of inflammatory hæmorrhage is mucous membrane, especially that of the lungs. The principal instances of it which fall under the surgeon's care, are epistaxis or hæmorrhage from the nose; hæmorrhois or hæmorrhage from the rectum; hæmorrhage from the urethra during gonorrhœa; and from granulating wounds. It has also been known to occur from the conjunctiva: and more rarely from the pleura, pericardium, and peritonæum. Sometimes the blood issues, not from the surface of the inflamed membrane, but from portions of adherent lymph, which have become vascular, and whose newly-formed capillaries have been over-distended and ruptured.

Diagnosis.—Inflammatory or active hæmorrhage is distinguished from that which is the result of congestion or debility, by the presence of pain, heat, and throbbing, and of a febrile state of the pulse and system generally.

Treatment.—This form of hæmorrhage is to be treated by bleeding if it can be borne ; and it may be observed, that it is less debilitating to employ one full venesection, so that the cause may be at once removed, than to let the blood dribble perpetually away from the part in small quantities ; and by purgatives and sedatives, especially lead and opium (F. 34, 35, 75). Cold, if it can be applied, perfect rest, and an elevated position, are the local measures.

(2.) In *passive hæmorrhage* the blood which escapes is venous. The principal instances of it are hæmorrhage from the nose in old subjects with diseased liver ; melæna, or hæmorrhage from the liver, and passive menorrhagia and hæmorrhois. The chief remedies are, dilute sulphuric acid, sulphate of alumina, acetate of lead, catechu, gallic acid, and other vegetable astringents, and ergot of rye. F. 186, 187, 14, &c.

CHAPTER VIII.

OF ADHESION OR THE ADHESIVE INFLAMMATION.

ADHESION, or the ADHESIVE INFLAMMATION,* is a process in which the fibrine or lymph of the blood is effused and organized. It is the process by which wounded and fractured parts are united ;—by which loss of substance is restored, whether produced by injury or disease ;—by which cysts are formed for abscesses, so as to prevent the diffusion of pus or other morbid fluids through the cellular tissue ;—by which wounded intestines are glued together so as to prevent the extravasation of their contents; and which in disease produces thickening and consolidation of organs, and obliteration of their cavities.

THE MATERIAL employed in this process, is the fibrine or coagulable lymph of the blood, mixed, no doubt, as Mr. Paget observes, with its normal proportion of fatty and saline matters. The leading characteristics of this substance are, first, its power to become more or less solid; then to develop itself into some form of organic structure. "Its chief tendency," says Mr. Paget, "is to develop itself into the common fibro-cellular, or connective tissue—the lowest form of vascular tissue, and the structure which, in nearly all cases in man, constitutes the bond by which disunited parts are again joined."

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* For a full account of the subject of this chapter, see Professor Paget's Lectures on the processes of repair, &c. delivered at the College of Surgeons, 1849. Med. Gaz. 1849.

But the precise form of development which the fibrine undergoes, depends in a great measure on the vital influences of the parts it is effused amongst, and on the offices which it is called upon to perform. Thus, if a bone be broken or inflamed, the fibrine effused will be converted into bone. If a bone be killed, or a small portion of one be abstracted from one of the lower animals, the fibrine effused will still be converted into bone. If (as in the case of an unreduced dislocation, or ill-treated fracture) the fibrine is subjected to frequent motion, part of it will be converted into bone, part into ligament, so as to form a new joint. When a nerve is divided, the lymph which unites the severed extremities, has nerve-tubules developed in it, so as restore the channel of nervous communication as before. But there are some structures which cannot be reproduced; such as muscle, which, if divided, is united merely by fibro-cellular tissue. The law which regulates the extent to which parts are capable of being reproduced after injury, is probably this, as stated by Mr. Paget. If any part is developed habitually by what he calls *nutritive reproduction*, in which (as in the case of the human teeth) one part gives off the germ out of which its successor is to be developed, then there can be no reproduction after injury; because, in removing any part, the germs or seeds of any future parts are removed with it. But when a part is formed by what he calls *nutritive repetition*, in which each succeeding part is simply developed after its predecessor, and not out of any germ furnished by it, then reproduction is possible. Thus, in the cuticle, the new layers are formed *after*, but not *out of* any germs left by their predecessors:—and, "when the whole cuticle of a part is removed, it may be again formed by repetition: but when a portion of muscle is removed, its germs are taken with it, and it is not reproduced."

Coagulable Lymph is a soft yellowish-white elastic substance, with the appearance of which every one who has examined the buffy coat of inflammatory blood, must be familiar. Examined under the microscope, it displays thin transparent parallel fibrils, and various molecules, granules, and corpuscles. These two elements point to two different modes in which it proceeds in its development.

(1) In the first mode the fibrine *sets* into a firm substance studded with nuclei, which gradually acquires first the appearance, and then the structure of fibres.

(2) In the second mode, the fibrine develops itself through the medium of cells. The first step in this process is believed to be

the formation of minute *Molecules* or *Granules*, composed in all probability, according to Ascherson's theory, of fatty matter coated with fibrine. These, by their own inherent vitality, associate themselves into groups, and so form larger bodies, called *nuclei*, or *cytoblasts*. These increase, imbibe fluid, and soon are seen to have a delicate vesicle surrounding them, with the nucleus imbedded or contained in it; and thus, nuclei are converted into *cells*.

Cells having been formed in the fibrinous blastema, proceed to develop themselves by enlargement and elongation; becoming successively caudate, or spindle-shaped, or lanceolate, till they are lengthened and attenuated to a cluster of fibres.

On comparing these two modes, it will be evident that so far as the production of new fibro-cellular tissue, the ordinary reparative material, is concerned, the former is the more direct means of attaining the desired end, and, consequently, the more perfect. On the other hand the course of development through nucleated cells is very liable to be perverted, and the cells to be converted into pus or some other morbid cell, if the degree of inflammation is in the least degree elevated above a certain point.

The pure fibrinous kind of lymph, which developes itself by the first mode, is produced by the healthiest constitutions, in which wounds and injuries are repaired easily and benignly by adhesion, without violent local inflammation, or constitutional disturbance. The corpuscular variety or that which developes itself through the medium of cells, is formed more easily in those constitutions which have a cachectic tendency; in which wounds are apt to *fester*, and not to heal readily. It is the material of which granulations are composed. These two varieties of lymph may be combined in any proportion.

Formation of new vessels.—Lymph effused, and in process of development, very soon becomes vascular. Sir E. Home relates a case in which some lymph, effused on the surface of the peritonæum became vascular within twenty-nine hours; but there is no doubt that the process may be effected much more quickly than this. The manner in which new blood-vessels are formed, is, according to Mr. Paget, by the successive outgrowths of loops of capillaries. "Suppose," says Mr. Paget, "a line or arch of capillary vessel passing below the edge or surface of a part to which new material has been superadded. The vessel will first present a slight dilatation in one, and coincidently, or shortly after, in another point, as if its wall yielded a little near the edge or surface. The slight pouches thus formed, gradually extend, as blind canals or diverticula from the original vessel, still directing their course towards the edge or surface of the new material, and crowded with blood-corpuscles which are pushed into them from the main stream. Still extending, they converge, they meet; the partition wall that is at first formed by the meeting of their closed ends, clears away, and a perfect arched tube is formed, through which the blood diverging from the main or former stream, and then rejoining it, may be continually propelled." A multiplication of new loops in this manner, inosculating in all directions, gives rise to the florid surface of granulations.

ADHESIONS AND CICATRICES, formed of newly developed fibro-cellular tissue (especially if developed through the medium of nucleated cells), are extremely liable to shrink, and become atrophied. Thus, the extensive cicatrices left after severe burns always contract greatly; and adhesions between serous surfaces may, in the course of time, disappear entirely. During certain states of constitutional cachexy (as the scurvy) old fractures have become disunited, and old cicatrices have broken out afresh into wounds; showing that the new tissue has less vitality than that of original formation.*

Parts liable to adhesion.—As we observed at page 31, serous membranes are very liable to be united by adhesive inflammation, whilst the lymph effused from mucous membranes is generally cast off, and does not become adherent or organized. But if two abraded and inflamed mucous surfaces are placed in apposition and left undisturbed, they may adhere;—as sometimes happens in the vaginæ of female children;—in the os uteri and Fallopian tubes of prostitutes, and in the ureters and biliary ducts when abraded by the passage of calculi.

Is blood organizable?—It has been a matter of dispute, whether coagulated blood, like pure fibrine, is capable of becoming organized. There can be little doubt, especially after the observations made by Mr. Prescott Hewett on extravasations into the cavity of the arachnoid and confirmed by other instances adduced by Mr. Paget, but that it *is* capable of conversion into an organized fibro-cellular substance precisely like the false membrane formed under the adhesive inflammation. This is of common occurrence after blood has been extravasated in the brain; moreover the coagula in obstructed blood-vessels, and in obliterated aneurisms also become covered with a thin false membrane, evidently formed out of the coagulum itself. Then it was long ago proved by Hunter, and has since been confirmed by Home, Macartney, Kiernan, and Dalrymple, that coagula are capable of becoming vascular. But yet for all practical purposes, it suffices to know that lymph, and not blood, is the material employed by nature, under ordinary circumstances, for the production of new tissues, and reparation of injuries; and that if blood be effused in any quantity it is rather a hinderance than a help: for the clots usually excite inflammation, and are extruded by suppuration.†

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* In examining the body of a madman who had stabbed himself in the abdomen fifteen different times during his life, the parts near the *most recent* wounds were found united by considerable false membranes;—at the situation of some that were older, there were only a few thin cellular adhesions; whilst, at the oldest, there was no trace of adhesion or false membrane whatever. Andral, Anat. Path. vol. i. p. 486.

† Vide Palmer's ed. of Hunter, vol. iii.; Catalogue of the Hunterian Museum, vol. i.; Carswell, op. cit.; Macartney, op. cit. p. 31; Home, Phil. Trans. 1818; Wardrop on Aneurism, in the Cyclop. Pract. Surgery; Dalrymple, Med. Chir. Trans. vol. ix.; P. Hewett, *ibid.*, vol. x., see also Lancet for 1845, vol. i. p. 219; Paget's Lectures, Med. Gaz. 1849 and 1850.

Examples of Adhesion.—This process may occur under an infinity of circumstances, some of the more frequent of which we proceed to enumerate:—premising, first of all, that parts of the body, when divided by clean incision, have under favourable circumstances the power of uniting directly, by apposition, as if they had never been severed, without the medium of lymph, or any other connecting material whatever. This may be noticed occasionally in cuts about the hand; rarely in larger wounds, such as the abstraction of a breast.

1. *Repair of Subcutaneous Injuries.*—Injuries in which the skin is not divided, are notoriously much more favourable, and less likely to be the subject of dangerous inflammation than those attended with an open wound. The slight inflammation excited by the injury soon subsides; and the divided parts are united by fibrinous lymph.

2. *Primary Adhesion of an open Wound, or Union by the First Intention.*—In this case, lymph is effused in a thin layer between two severed surfaces, and quickly developes itself into a fibro-cellular tissue, whilst its exposed surface becomes covered with a cuticle or epithelium covering a thin line of cicatrix.

3. *Healing under a Scab, and by the Modelling Process.*—Scabbing is a natural and most speedy mode of cure for wounds which cannot be covered by skin. The wound acquires a covering of dried blood, under which a thin layer of lymph quickly developes itself into fibro-cellular tissue covered with cuticle, which, when accomplished, the scab drops off. This mode is very common after injuries to the lower animals. In man it is difficult to produce, from the greater liability of the wound to inflame, and of the lymph to degenerate into pus, which detaches the scab; or causes great pain if it is shut up under it. (*See the Chapter on* WOUNDS. Part III. Chap. I.)

4. *Healing by Granulations.*—In this process, an open wound, whether produced by injury, or by the bursting of an abscess, becomes covered with lymph, which is thrown up into little points, and if healthy is quite florid from the abundance of its blood-vessels. Its surface secretes a fluid called *pus*, formed out of such of the lymph as is incapable of organization, as will be more fully described in the next chapter. This is the mode in which open wounds generally heal in the human subject; but it is an imperfect mode; because granulations are extremely liable to be diseased, and because they entail a great waste of material which escapes in the form of pus. When two surfaces covered with granulations are made to unite, the union is said to be by *secondary adhesion*, or by the *second intention.*

5. *Adhesion as a Morbid Process.*—When acute or chronic inflammation affects the serous membranes of the chest and belly, or the iris, lymph is very liable to be effused and converted into bands of adhesion, glueing neighbouring parts together. This, which when occurring spontaneously, is morbid and injurious, is after injury a most beneficial means of limiting effusions, and glueing together severed parts. Chronic thickening, and indurations, such as those which encircle the œsophagus and urethra in stricture, are formed by

the infiltration of lymph into the cellular tissue, and its conversion into a tissue of gristly firmness.

6. *Adhesion morbidly Perverted.*—Under certain peculiarities of constitution the lymph effused, whether in spontaneous inflammation, or in that excited by injury, may acquire various morbid modes of development, of which examples will be found under the head of tubercular and cancerous diseases.

Is Adhesion truly an Inflammatory Process? — The student can hardly fail to notice a contrariety in the expressions used by various authors in speaking of adhesion. Some speak of the *adhesive inflammation* as a most beneficial process, without which even the wound made in venæsection would be fatal. Others speak of inflammation as a thing altogether contrary to, and destructive of adhesion; and treat the latter when occurring beneficially in the repair of wounds, as a purely non-inflammatory process. To reconcile this apparent contradiction it must be observed, that they who regard adhesion as an inflammatory process, admit that the degree of inflammation is extremely low; so low that it is attended with no heat and no pain; and that if the inflammation proceed beyond this degree, the lymph instead of becoming organized will be broken up into pus;—so that they use in practice precisely the same measures for keeping inflammation at a low pitch, which the other party use with the view of preventing any inflammation at all. Looking at our definition of inflammation, as a state of altered nutrition accompanied with increased vascularity, it is difficult to exclude adhesion, as it commonly occurs, from being considered an inflammatory process.

TREATMENT.—If it be the object to promote adhesion, the general principles of treatment are, to maintain the most perfect rest and apposition, and to use such local and constitutional measures as will prevent heat, pain, and throbbing; in other words, to prevent the inflammation from proceeding to a grade of greater intensity than the adhesive. In a few cases (as after the operation for harelip in a languid scrofulous habit) it may be necessary to excite the energies of the system by wine, to render them sufficient for the production and healthy organization of lymph.

If it be wished to counteract the adhesive inflammation; then use must be made of the antiphlogistic treatment generally, and of mercury in particular.

If it be wished to remove adhesions, or thickening, the results of previous acute or existing chronic inflammation, the general rules must be attended to which were laid down for the treatment of chronic inflammation. *Mercury* is the most efficient internal remedy, and for an example of its use to remove adhesion, reference may be made to *chronic iritis.* The local means that may be used to remove the thickening left by a quite subdued inflammation of any external part, are friction, stimulating liniments, F. 143, 150, ointments containing iodine, or mercury; gentle exercise; shampooing; pressure by bandages or otherwise; cold affusion; electricity and galvanism; discutient lotions, especially those of zinc, F. 117, or muriate of ammonia, F. 118; blisters, or other counter-irritants—always taking care not to reproduce active inflammation by too violent stimulation.

CHAPTER IX.

SECTION I.—OF THE THEORY OF SUPPURATION AND PROPERTIES OF PUS.

Production of Pus. 1st. *In abscesses.*—According to the doctrines stated in the preceding chapters, whenever the effusion of fibrine is attended with too acute a degree of inflammation, or when there are certain defects in the constitution, the cells which develope themselves in it, instead of going on to form fibrous tissue, often undergo a species of degeneration, become incapable of assuming any higher form of life, and, being mixed with the spoiled liquor sanguinis, form a creamy fluid called *pus.* When this takes place in the cellular tissue, or in the serous membranes, joints, or any other cavity in the body, an *abscess* is said to be formed. In the cellular tissue the lymph which surrounds the pus acquires a degree of organization, and forms a *sac* or *cyst*, which circumscribes it, and contains it.

2nd. *In open granulating wounds.*— In the case of wounds and other injuries, in which a portion of the tissues is left uncovered by skin; or of wounds, which have not united by adhesion, the exposed surfaces, after bleeding has ceased, and a thin reddish serum has ceased to exude, become glazed over with a greyish or buffy coat composed of fibrine and the white corpuscles of the blood. Two or three days pass, more or less; the vicinity of the wound displays evidence of slight inflammation, and lymph is effused in thin layers. Of each layer a portion soon becomes vascular, and its surface is thrown up into little eminences called granulations, which secrete a fresh layer; another portion degenerates into pus, forming a bland creamy covering for the granulating surface. *Granulations* are composed, as to structure, of nucleated cells, developed out of lymph. If healthy, and proceeding towards a cure, they are small, pointed, and florid; they bleed if wiped, and are not very tender. But they are subject to many disorders; being sometimes pale, bloated, and œdematous; sometimes degenerating into a pseudo-mucous membrane; sometimes breaking up suddenly, and being dissolved into a sanious fluid. When however the case proceeds favourably, the wound or cavity becomes filled up with the growth of repeated layers of them, and whilst the undermost are developing into fibro-cellular tissue, those on the surface form themselves into cuticle, and so the wound is healed.

Cicatrization.—This process of healing, or cicatrization, is attended with an absorption of inflammatory effusion in the vicinity of the wound, and a contraction of its margin, so that the wound becomes much smaller before any new cuticle is formed. Its edge then begins to look smooth and bluish, a thin pellicle of new cuticle gradually spreading from the edge in a converging circle, till the wound is closed. The material that closes the gap is called a cicatrix: it is a band of fibrous tissue covered with cuticle, at first reddish, and closely bound down to the parts beneath; afterwards shrinking, being paler and firmer, and likewise looser, through atrophy of the hard tissue beneath it.

3rd. *Suppuration on Mucous Membranes and Skin.*—Some mucous membranes, as those of the eye and genito-urinary passages, when acutely inflamed, readily secrete a thick and very perfect pus. The membranes of the air passages, on the contrary, secrete a viscid, or ropy, or watery liquid, mixed with pus globules, and with others consisting apparently of ill-formed epithelium cells. The skin when denuded of cuticle, and irritated, readily suppurates.

4th. *Pyohæmia, or Suppuration of the Blood.*—In the year 1838, when increased attention was beginning to be paid to the condition of the blood in disease, Mr. Gulliver announced that he had discovered pus in the blood of patients labouring under small-pox, puerperal fever, and other affections of a typhoid cast. Hence there seemed reason for believing that a suppuration in the blood might be the essential condition of such maladies. Mr. Mayo shortly afterwards announced the discovery that pus globules exist in the blood of almost every person—but the globules so announced were certainly, if Mr. Gulliver's were not, merely the white, or lymph corpuscles of the blood. Whether pus is ever formed in the blood, out of any of its constituent parts, without being secreted by the coats of the blood-vessels, is not known.

But there is a remarkable phenomenon, frequently met with in phlebitis, puerperal fever, and erysipelas, and other diseases of the same cast, namely, the formation in rapid succession of abscesses in the lungs, liver, joints and other parts; which abscesses form so quickly, that it has been supposed impossible that the pus could be elaborated in the parts in the time, but that it must be a deposit of pus previously circulating in the veins. Hence such abscesses have been called *purulent depôts*, or *secondary*, or *metastatic* abscesses.

On this subject we can only observe, 1st., that it is not probable that pus, as such, is ever absorbed into the blood from wounds or abscesses, unless there is some aperture in the coats of a vein; the pus globules being too large to pass unbroken through the coats of the capillaries. 2ndly. That in cases of phlebitis, pus is often found in the veins; and, with other morbid secretions, no doubt mixes more or less with the blood. 3rdly. That pus present in the veins might lodge in the capillaries of the lungs or other parts, just as quicksilver does if injected into the blood, and there excite a rapid and diffused suppuration.

Physiological relations of Suppuration. 1st. Suppuration is essentially a morbid process ; yet as it may accompany other processes which tend to a beneficial end (such as granulation), so it is customary to speak of it when accompanying such beneficial processes, as *healthy*, and to describe the product as *healthy pus*. Moreover, though suppuration be a morbid process, it often takes the place of other processes infinitely more morbid. Thus after a very severe lacerated wound, when the patient has passed through several days of fearful constitutional excitement ; or after sloughing, or rapid phagedænic ulceration, nothing delights the surgeon more than the sight of healthy pus, because he knows that it announces at least an attempt at reparation, and the cessation of violent febrile excitement. 2ndly. The formation of abscesses often seems to serve as a means for eliminating some noxious matter from the blood. 3rdly. Suppuration affords a mechanical means of removing foreign substances impacted in the soft parts. *Lastly*, if too profuse, it may exhaust the vital powers, and bring on hectic fever.

PROPERTIES OF HEALTHY PUS.—Pus is a yellowish white, opake fluid, of the consistence of cream : free from smell, neither acid nor alkaline, said to have a sweetish, mawkish taste, insoluble in water, although freely miscible with it, and very slow to putrefy. Like many other animal fluids, it consists of a thin serum, holding a vast number of globules in suspension, from which it derives its colour and opacity.

Chemical Analysis.—The most recent analyses, especially those of Bonnet of Lyons, Gueterbock, and Davy,* show that pus contains water (86·1 per cent.), fat soluble in alcohol (1·6), fat and osmazome soluble in cold alcohol (4·3), and albumen and the matter of the globules, soluble in neither hot nor cold alcohol (7·4). The substance of which the globules are composed has received the name of *pyine ;* but it seems to differ very little from fibrine. Pus also contains about 0·8 per cent. of salts ; chiefly common salt, and muriate of ammonia.

Pus Globules.—When these are examined under the microscope, they are found to be opake spherical globules apparently granulated like mulberries, but in reality smooth, as may be known by examining their circumference. They measure from 1-5000th to 1-2000th of an inch in diameter ; some even are much larger ; especially if they proceed from a surface that is actively inflamed. They may be shown to consist of an envelope, or cell-membrane, containing nuclei, oil globules, and minute granules. If acetic acid be added, it brings clearly into view two, three, or four nuclei ; and renders the other parts transparent, or so invisible that they seem to have dissolved. They are not really dissolved, however, because the nuclei retain their adhesion to each other ; and because if liq. potassæ be added, the original appearance is restored. These central nuclei furnish the best means of distinguishing pus from other similar globules. If kept till putrefaction is commencing, or if treated with a small quantity of liq. potassæ, the oil globules become extremely distinct; but too much either of the alkali, or of decomposition, dissolves the outer envelope. Besides the globules, other smaller albuminous molecules are also found in pus in great abundance, of the same nature apparently as the central molecules of the globules.

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* Vide Mayo, Med. Gaz., Oct. 19th, 1839 ; Vogel, über Eiter und Eiterung, p. 35 ; Davy, op. cit. vol. ii. p. 468 ; Bonnet, Med. Gaz. vol. xxi. ; Gueterbock de Pure et Granulatione, Berol, 1837.

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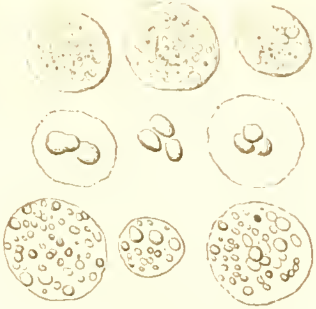

Many of the properties of pus depend on these globules. Its specific gravity for instance (which varies from 1·021 to 1·040), and its density, depend on the number of them. Moreover, pus is coagulated by a strong solution of hydrochlorate of ammonia. But this coagulation is not produced by the solidification of matters previously fluid, like the coagulation of blood or milk; neither is it caused by the salt merely abstracting the water of the pus, as Pearson supposed; but it depends on a change in the globules, which become more transparent, elongated, and adherent. Freezing also renders pus viscid, and has a similar effect on the globules. A heat of 165°, however, coagulates it by acting upon the albumen of the serous portion.

VARIETIES OF PUS.—1. *Healthy Pus* (called also *creamy* or *laudable*) is that which has already been described, and is the product of healthy inflammation in healthy parts. It is album, læve, liquidum, et laudabile.

2. *Serous Pus* is thin, and yellowish or reddish. It contains very little fatty matter or fibrinous globules, and is the product of a low degree of inflammation in weak constitutions.

3. *Clotty* or *Curdy Pus* resembles the serous, but has numerous white clots and flocculi of coagulated fibrine floating in it. It is commonly found in scrofulous abscesses.

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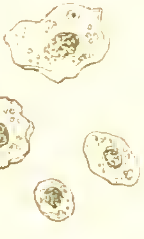

4. *Mucous Pus* or *Muco-purulent matter*.—Healthy mucus consists of a more or less viscous matter containing a very few globules (hardly to be distinguished from the white globules of the blood, or from pus globules,) and epithelium scales cast off by the membrane from which the mucus was secreted. The globules contain much less oil

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[*] The uppermost group gives a pretty accurate idea of the appearance of pus globules magnified 400 diameters. The middle figures represent globules treated with acetic acid;—the lowest represent the appearances when pus is partially decomposed or treated with liq. potassæ. These figures were drawn from nature by Dr. Westmacott, under the superintendence of Dr. Johnson of King's College.

[†] This cut after Vogel, shows the transition from the flat irregularly five-sided epithelium scale to the round globule.

than pus globules do. Under inflammation there is an increased exudation of albuminous liquid; the epithelium cells are shed before they have become flattened out; the quantity of globules is greatly increased, and they acquire the exact character of pus globules. The question of the *diagnosis between pus and mucus*, is not of the same consequence now, as it was at the time when pus was supposed to indicate the existence of an ulcer. Muco-purulent matter *is pus*, only mixed, perhaps, with epithelium, or modified chemically by various local conditions;—the contact of urine, for instance.

A very viscid pus, like mucus, is occasionally found in chronic abscesses, containing a large quantity of hydrochlorate of ammonia,—a salt which abounds in unhealthy pus.*

5. *Concrete*, or *Lardaceous Pus*, consists of common pus, thickened by the absorption of its watery parts, in consequence of having remained for a long time in a chronic abscess, or bony cavity †—as the antrum and nasal sinuses.

6. *Putrid Pus* has a fœtid smell, and alkaline reaction, in consequence of the presence of hydrosulphate of ammonia: which is formed by the decomposition of albumen, when pus is exposed long enough to air and heat, especially if serum or blood, or some other animal fluid be mixed with it.

7. *Specific Pus*, capable of producing the venereal disease or the small-pox, may not differ in its sensible qualities from the healthiest, but must include some matter in a peculiar state of decomposition, which state is capable of being imparted to other living matter.

8. Pus is said to be *ichorous* when thin and acrid; *sanious* when thin and bloody: and *grumous* when mingled with dark half-curdled blood. The pus from spreading ulcers and cancers is thin and serous, containing blood globules, and shreds and debris of the ulcerating tissue.

RAMOLLISSEMENT.—This is a peculiar effect of inflammation which is observed in greatest perfection in the brain and spinal cord, portions of which become soft, pulpy, and at last diffluent, like thick cream. It has been shown conclusively by Dr. Hughes Bennett, of Edinburgh, that this process is a mere variation from the ordinary course of suppuration. The affected tissue is first infiltrated with fibrine, which "coagulates in the form of granules which may be seen coating the vessels, and filling up all the space between the ultimate tissue of the organ." Thus the organ affected is rendered perfectly dense or hepatized. The granules next form

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* Pearson, Phil. Trans. 1810. Mucus gives out more ammonia, when treated by lime or potass, than pus does.

† Mayo, Pathology, p. 159.

themselves into nucleated cells (*exudation corpuscles*) which after a time break up, and are disintegrated, together with the tissue which they infiltrate; and on examining the softened mass with the microscope, it is seen to consist of granules, either diffused or amalgamated in masses, or contained in nucleated cells, and mixed with the debris of the softened tissue.*

SECTION II.—OF ACUTE ABSCESS.

DEFINITION.—An *abscess* may be defined to be a collection of pus in the substance of any part, or in any cavity. There are two kinds; 1. The *acute* or *phlegmonous*; 2. The *chronic* or *cold*; besides the *diffused abscess*, or diffused suppuration in the cellular tissue, of which we shall speak in the next chapter.

SYMPTOMS.—Acute abscess (which, when occurring in the subcutaneous cellular tissue, is called *phlegmon*) commences with all the ordinary signs of acute inflammation; namely, inflammatory fever; severe throbbing pain; bright redness; and much swelling;—firm in the centre, and œdematous around. The occurrence of *suppuration is indicated by severe rigors*, by an abatement of the fever, and a change in the pain,—which is converted into a sense of weight and tension, with a pulsatory feel at each beat of the arteries. Then the tumour becomes softer, and loses its bright arterial colour; and as the quantity of matter increases, its centre begins to *point*, that is, to project in a pyramidal form, and *fluctuation* can be felt by alternate pressure with the fingers.

PROGRESS.—The pus having been formed, the next step is its evacuation, which is effected either by what Hunter called *progressive absorption*; that is, the successive absorption of all the parts intervening between the abscess and the surface; or, just as probably, by their successive atrophy and disintegration. Be this, however, as it may, the tumour becomes more and more prominent and soft; the surrounding inflammation and tumefaction subside; the centre becomes of a dusky red or bluish tint, the cutis is removed, the cuticle bursts, and the pus escapes.

Although abscesses may burst into serous cavities, or mucous canals if they happen to be near, still their general course is that which is least prejudicial;—namely, towards the skin. The cause of this happy provision has much engaged the attention of pathologists. The best explanation that can be offered, although not quite a satisfactory one, is, that the pus, as it increases in quantity, advances towards the skin, because in that direction it is opposed by the least pressure.

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* See Microscopical Journal for Jan. 1843, and Bennett on Softening of the Brain, Ed. Med. and Surg. Journ., Dec. 1842. The foregoing cut represents the granules mixed with broken nerve-tubes; from a case of softening of the brain. —Vide Copland, Dict. Pract. Med. *Art.* Abscess; Ferguson on Puerperal Fever, Lond. 1839; Ancell, case of purulent deposit into all the joints after small-pox; Med. Chir. Trans. vol. xxi. The author has also borrowed from a lecture on Phlebitis delivered by Sir B. C. Brodie, at St. George's Hospital, in Nov. 1839.—Vide also Grüby on the Morphology of Pathological Fluids, translated by Dr. Goodfellow in the Microscopical Journal, vol. ii.; Gerber, Anatomy translated by Gulliver; Mayo and Gulliver in Med. Gaz. 1839-40, vol. i.; Paget's Lectures, Med. Gaz. 1849 and 1850.

CAUSES.—Acute abscess is mostly *idiopathic*, that is, depends on a disordered condition of the blood, and is a frequent sequel of fevers; —it may, however, be caused by blows, ecchymoses, or by foreign bodies introduced into the skin or flesh.

TREATMENT.—In a case of idiopathic abscess the indication always is to remove, if possible, the morbid state of constitution on which it depends, and to hasten the process of suppuration by warm poultices. In abscesses arising from local injury, all exciting causes, such as thorns, splinters, &c., should be removed, and inflammation be combated at first by leeches; but, as soon as suppuration seems inevitable, poultices should be applied.

Poultices relax the skin, promote perspiration, soothe pain, encourage the formation of pus, and expedite its progress to the surface. They should be large, soft, and light, and may be made of bread and water, or linseed meal, or of camomile flowers boiled till they are soft, or of bran sewed up in a linen bag, which may be dipped into boiling water as often as it becomes cold, F. 152, &c.

The *warm-water dressing*,—that is, a piece of soft lint or folded linen dipped in warm water, and covered with oiled silk to prevent evaporation, and the *spongio-piline* are good substitutes for poultices in many cases, especially for irritable sores; but when there is much pain they are not so soothing as the large soft warm mass of a well-made poultice.

Respecting the *opening of abscesses*, it may be laid down as a general rule, that if they point and become pyramidal, without enlarging in circumference, they *may* be left to burst of themselves; but that if they enlarge in breadth and circumference, without tending to the surface, they should be opened. In the following six cases, however, the surgeon's aid is imperatively demanded:

1. When matter forms beneath fasciæ and other dense ligamentous textures, such as the sheaths of tendons, or under the thick cuticle of the fingers. Because, as these are absorbed or softened with the utmost difficulty, the pus, instead of coming to the surface, will burrow amongst muscles and tendons, extending the abscess to great distances; —producing extreme pain and constitutional disturbance, by its tension of the fasciæ which cover it, and pressure on the parts beneath,—endangering extensive sloughing, and impairing the future motions of the part. Hence, as a general rule, all abscesses beneath fasciæ, or among tendons, or under the thick cuticle of the fingers, should be freely opened, as soon as the existence of matter is suspected.

2. When abscess is caused by the extravasation of urine, or other irritant fluids; or when it contains an unhealthy matter, which might diffuse itself and spread the disease: as in carbuncle.

3. When an abscess is formed in loose cellular tissue (as around the anus), which would readily admit of great distension and enlarge-

ment of the sac, and more especially if the cellular tissue is partially covered with muscles (as in the axilla), under which the matter might burrow.

4. In suppuration near a joint; or in the parietes of the chest or abdomen; or under the deep fascia of the neck; lest the abscess burst into the serous cavities, or the trachea; or cause compression of the trachea, œsophagus or jugular veins.*

5. In suppuration of very sensitive organs, as the eye or testis.

6. When it is desirable to avoid the scar which always will ensue when an abscess ulcerates spontaneously.

And in the first three of these cases it is much better to make an opening before matter has formed, than to delay it for one moment afterwards.

Abscesses may be punctured with a large lancet, used as in venæsection, or with the sickle-shaped bistoury, commonly called *Syme's;* or, if deep and extensive, by a straight-pointed double-edged bistoury. Holding it like a pen, the surgeon should gently plunge it in at a right angle to the surface, till it has entered the cavity; which may be known by a diminution to the feeling of resistance, or by gently turning the instrument on its long axis, so that a drop of pus may well up by its side. Then the aperture may be enlarged sufficiently as the instrument is being withdrawn. The puncture should be made either at the most depending part of the abscess, or else where the matter points most decidedly and the skin is the thinnest; and a very fine strip of oiled lint (called a *tent*) may be gently introduced between the edges of the opening, and be allowed to remain for the first forty-eight hours, to prevent them from closing again. No rude attempts should be made to squeeze out matter; but it should be allowed gradually to exude into a poultice or fomentation.

The poultices may be continued till all the pain has subsided, and the cavity has begun to granulate; but not too long, lest the granulations become weak and flabby. And then the best plan is to apply a compress of linen, and a bandage. If the cavity does not contract speedily, it must be treated as a *weak ulcer* or *fistula.* If the suppuration continues profuse, tonics, change of air, and a good diet are advisable, in order to prevent hectic, and enable the constitution to repair the local mischief.

It occasionally happens that acute abscesses (especially those occurring in glandular textures and venereal cases) are cured by the absorption of their pus. This is likely to happen when, after acute inflammation, the matter remains without tending to come to the surface, and without pain: the means best adapted to promote it are cold lotions,—mercurial plaster,—purgatives and tonics,—and above all things a sea voyage, so as to cause considerable sickness.

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* In Dr. Cormack's Lond. and Ed. Med. Journ., March 1843, is related a case in which an abscess burst into the internal jugular vein; other cases are known in which abscesses have burst into arteries.

SECTION III.—CHRONIC ABSCESS.

General Description.—Chronic abscesses are the result of a low degree of inflammation; so slight indeed, that their existence is often unsuspected for a long time. They are mostly lined with a thin, reddish grey, distinctly organised cyst;—there is little or no vascularity in the parts adjoining;—and the pus usually is *serous* or *curdy*. They are often deep-seated, whilst the acute are mostly superficial.

Causes.—The causes are chronic disease of bone, or other source of slow irritation, in a weak and scrofulous habit.

Symptoms.—When first detected, a chronic abscess appears as an obscure tumour, with a fluctuation more or less distinct according to its distance from the surface. It is free from pain, tenderness, swelling, and redness, unless far advanced or accidentally inflamed.

Progress.—These abscesses may attain an enormous magnitude, before the coverings ulcerate. When, however, from the increasing distension, or from some accidental irritation, this does happen, the skin reddens, inflames, and ulcerates, and so the matter is discharged.

Terminations.—(1.) In slight cases the interior of the sac pours out granulations;—the reddened skin around the orifice ulcerates;—and the sore so formed may heal. (2.) If the restorative powers are weak, or the abscess is caused by a piece of diseased bone or some other source of irritation which is not removed, one or more *sinuses* may remain. (3.) If, on the other hand, the abscess is very large, or if, after the admission of air, the pus have not a free exit, a most serious train of consequences will ensue. The pus, exposed to the atmosphere, putrefies;—the hydrosulphate of ammonia (the product of putrefaction) is absorbed into the blood;*—the interior of the sac inflames,—and then the grave and irreparable local disease, together with the contamination of the blood, induces typhoid fever, under which the patient sinks.

Prognosis.—Hence the danger of these abscesses will be great, if the sac has attained a large size, and has advanced so far towards ulceration, that a spontaneous and permanent aperture is inevitable;—more especially if it is connected with diseased hip or vertebræ, which will keep up the secretion of pus, and prevent it from closing.

Treatment.—There are three *indications:* (1.) To amend the general health by pure air, proper regimen, and other means detailed in the Chapters on Chronic Inflammation and Scrofula. If (as in the case of psoas and lumbar abscess) the abscess has been caused by some local disease, the latter must, if possible, be ascertained, and removed by proper measures.

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* It may be detected in the blood and urine. The blood in these cases is black, and refuses to coagulate;—which is precisely the effect produced by adding the hydrosulphate of ammonia to healthy blood. Vide M. Bonnet's Papers in the Med. Gaz. vol. xxi.

(2.) To procure absorption of the matter, if possible. This may sometimes be effected by stimulants and counter-irritants applied to the tumour or its vicinity; as the Emp. Ammoniaci cum Hydrarg.; or F. 160.

(3.) But if the tumour continues to enlarge, it cannot be opened too soon;—especially if there is any incipient redness of the skin. And a different proceeding is requisite in different cases.

If the abscess is superficial and small it may be opened with a lancet or bistoury; the raspberry-cream-looking matter, with flakes of lymph floating in it, should be gently evacuated, and some strips of adhesive plaster, or a compress and bandage wetted with zinc lotion, should be passed round the part, so as to keep the sides of the sac in apposition with a moderate degree of pressure. Thus, a free exit being provided for the pus, the opposing surfaces of the cavity will often granulate and adhere; then the external aperture heals, and the case is cured. If from deficiency of action this adhesion will not take place, weak stimulating injections may be used, such as F. 117, diluted; or another aperture may be made, and a seton be passed through the sac;—or if it be long and fistulous, it may be slit up, and made to heal from the bottom.

In some cases, when a considerable portion of skin has become thin and red—showing that it will certainly ulcerate and form a large aperture, it will be advisable to apply the caustic potass, so as to destroy it, and avoid the more painful and tedious process of ulceration.

If an abscess is seated in the neck of a female, it is of the greatest consequence to make an early opening, so that no scars may be left. The instrument recommended by Sir A. Cooper for this purpose is a very fine lancet, only one-eighth of an inch broad. A grooved needle will answer the same purpose. The puncture should be large enough to extract all flakes, but no larger; and it should be made transversely, so that its minute cicatrix may be hidden by the folds of the neck. Adhesive plaster, or *collodion*, should then be applied with moderate pressure;—and weak injections, especially F. 90, may be used, if the sac does not become obliterated in the course of a few days.

Large Chronic Abscesses.—If the abscess is so large that the exposure of its cavity would lead to the evil consequences that have been enumerated; or, if it is connected with disease of the spine or other bone (as in the case of psoas abscess), the following plan should be resorted to, with a view of inducing a contraction of the sac, and of diminishing the danger from a permanent opening, should one be established subsequently. A *small puncture* should be made at the most depending part of the tumour. Mr. Vincent recommends a trocar. As much matter as flows spontaneously should be permitted to escape, the parietes of the abscess should be brought together by careful bandaging, and then the puncture should be carefully closed by *collodion* or plaster, and the patient be kept at rest till it is healed. During the flow of the matter, the greatest care ought to be taken to prevent the admission of air into the sac. At the expiration of ten days or a fortnight, when it is nearly refilled, a second puncture should be made (but not too near to the former), and should be healed again in like manner. This operation should be repeated at proper intervals, taking care never to let the abscess become so distended as it was before the previous puncture,—and using *moderate* support by bandages in the intervals. Thus, in fortunate cases, these repeated partial evacuations, combined with proper constitutional measures, will cause the abscess gradually to contract;—so that it either becomes completely obliterated, or degenerates into an insignificant fistula.*

This method of treatment was introduced by the late Mr. Abernethy. He, however, recommended *as much as possible* of the matter to be evacuated at each operation, instead of allowing it to run spontaneously;—which latter method is much better calculated to preclude the admission of air, and avoids all irritation of the cyst by rough handling or squeezing.

But if air have gained admission into the cavity of the abscess, and the pus have become putrid, and prostration of strength and dry brown tongue show its influence on the system, then the indications plainly are, to make free openings and counter-openings, so as to prevent all lodgment of the putrid pus ; and to wash out the sac occasionally with injections of warm water, containing a very little of the solution of chloride of soda. At the same time the general treatment of typhoid fever must be adopted, and the strength be supported by wine, nourishment, opium, &c.

CHAPTER X.

OF ERYSIPELAS AND DIFFUSE INFLAMMATION OF THE CELLULAR TISSUE.

SECTION I.—PATHOLOGY OF ERYSIPELATOUS INFLAMMATION.

Instead of treating of erysipelas amongst the diseases of the skin, as if it were a mere example of ordinary inflammation, attacking the skin, and deriving its peculiarities solely from the structure affected, we shall adopt the opinion that was doubtfully held by John Hunter,† but which has been clearly substantiated by recent pathologists, and describe it as a peculiar unhealthy form of inflammation, which may attack various tissues, but which, wherever situated, exhibits certain characters that distinguish it from ordinary inflammation.

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* Vide Fergusson's Practical Surgery, 2nd ed. p. 79, and Lancet, Nov. 6, 1841, for an excellent case treated successfully in this way in the King's College Hospital. M. Bonnet has suggested that the part in which the abscess is situated, might be immersed under water at the time it is punctured. This would, of course, render the ingress of air impossible.

† Hunter's words are, "in some constitutions, every inflammation wherever it exists, will probably be of this kind;" and (speaking doubtfully of the erysipelatous nature of inflammations of mucous membranes he adds), "whatever the inflammation may be, it is certainly attended with nearly the same kind of constitutional affection. The fever in both appears to be the same;" *i. e.*, as in erysipelas.

These characters of erysipelatous inflammation are the following:— It has a disposition to spread widely along the surface of membranes, or in the cellular tissue. The lymph which is secreted is incapable of organization, and instead of confining effusions into the cavity of an abscess, permits them to be diffused widely, and thus to extend the disease into sound parts. Erysipelatous inflammation is liable to attack different parts, sometimes simultaneously, sometimes by *metastasis;* that is, leaving one part and flying to another, thus giving evidence of its origin in a vitiated state of the blood: Lastly, the different varieties of erysipelatous disease prevail epidemically together, and are capable of propagation by infection and contagion. Thus Dr. Ferguson tells us, that erysipelas and puerperal fever are generally co-existent in his lying-in hospital, the mothers perishing of one, and the infants of the other. Instances are now common enough, showing that the contagion of erysipelas may cause puerperal fever, just as inoculation with the fluids of a female who has died of puerperal fever is a most fatal source of diffuse cellular inflammation to the dissector. Moreover, during the prevalence of erysipelas in the London hospitals, phlebitis and purulent depôts are generally prevalent likewise.[*]

The diseases which may be grouped together as partaking of the erysipelatous character, are all probably caused by the admission of some putrid miasmata into the blood, of which miasmata there are no sources so prolific as hospitals in which the sick are crowded together. Hence Dr. G. Gregory has proposed to distinguish these diseases by the term *ochletic*, derived from ὄχλος, a crowd. The chief varieties are the simple or cutaneous, and the phlegmonous or cellulo-cutaneous erysipelas; the diffuse inflammation of the cellular tissue; acute phlebitis; puerperal fever; and the *suppurative diathesis*, or *pyohæmia*, i. e., the peculiar state of constitution in which abscesses or *purulent depôts* are liable to form suddenly and unexpectedly in the liver, joints, lungs, and other parts of the body.

Since hospitals are frequently rather a curse than a blessing through the mortality arising from erysipelatous diseases, contracted within their walls, or carried into the lying-in chamber, no pains should be spared to obviate the causes, and to prevent the extension of these diseases. Hospitals should have rooms, in which the convalescents should be during the day. The floors should be dry-rubbed and polished, not washed. The walls and ceilings should be whitewashed at regular short intervals. The best apparatus should be used for ventilation that can be devised. The feather beds and mattresses should be baked, and the bedsteads be taken to pieces and exposed to the air, at least once a year. No patient should be put into a bed just quitted by another. The patients should be obliged, when practicable, to use the warm bath and soap; and when not able to do so, their feet should be washed often. On the outbreak of the disease, all the inmates who can be moved, should be sent away; the infected ward be shut up, and the erysipelatous patients put into separate small rooms. Surgeons and pupils should not come to the bed-side, especially *to a midwifery case*, immediately from the dead-house or dissecting-room, still less from a case of erysipelatous disease. The dressings and bandages used in any case should be destroyed, and tow, which may be destroyed when once used, should be substituted for sponge, which would be used again and again. Moreover, in the case of fœtid and profusely suppurating wounds, it would be far better for the patient so affected, and for the others likewise, that he should be put into a hut, or tent, or cottage, than be allowed to remain in a crowded ward.

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[*] Vide Ferguson on Puerperal Fever, p. 29; Mr. Storrs, of Doncaster, who first clearly proved the common origin of these and other septic diseases, in the Prov. Med. Jour, 23rd April, 1842, Paley, Lond. Med. Gaz., June 6, 1842, on the Production of Puerperal Fever by infection from Erysipelas; Nunnely on Erysipelas, Lond. 1841; Dr. G. Gregory on *Ochlesis*, Lancet for July, 15, 1848; Routh on the Puerperal Fever of Vienna, Med. Chir. Trans. vol. xxxii.

SECTION II.—OF THE CUTANEOUS AND CELLULO-CUTANEOUS ERYSIPELAS.

DEFINITION.—Diffused inflammation of the skin, or skin and cellular tissue, with a tendency to spread.

SYMPTOMS.—The *cutaneous* or *simple* erysipelas is known by redness of the skin, which *disappears momentarily on pressure*;—considerable puffy swelling from serous effusion into the cellular tissue;—and severe stinging, burning, or smarting pain. The redness is generally of a vivid scarlet hue; but it will be faint and yellowish if the disease is attended with much debility, or if it affect the eyelids, scrotum, or other loose cellular parts, where it always produces a good deal of serous effusion.

In the *cellulo-cutaneous*, or *phlegmonous* erysipelas, the redness is deeper, and sometimes dusky or purple, and it is *scarcely*, if at all, *dispelled by pressure*;—the swelling is much greater, and is hard, brawny, and tense;—and the pain is not only burning, but throbbing.

Constitutional symptoms.—Both varieties are ushered in with shivering, headache, pain in the back, nausea, and bilious vomiting; and both are attended with fever, which will vary in its type according to circumstances. It may be of an ardent, sthenic, inflammatory character, requiring free blood-letting, if the disease affect a young robust countryman; but it soon assumes a low typhoid character, if the patient is old and weak; or if the disease were contracted in some close, foul, ill-ventilated hospital, or if a large portion of cellular tissue has begun to slough. When erysipelas is situated on the face and scalp, it will be liable to be complicated with delirium in its early stages, and coma in the latter, from the irritation propagated to the brain and its membranes.

TERMINATIONS.—The *cutaneous* erysipelas may terminate, 1, in resolution, leaving nothing but desquamation of the cuticle with slight œdema (this mild form is often called *erythema*); 2, but more frequently it produces large *bullæ* or vesicles from effusion of serum under the cuticle;—and these dry into scabs, which peel off, and leave the cutis either healed, or superficially ulcerated. 3. Sometimes, however, it is followed by small abscesses. The ordinary duration is from seven to fourteen days.

Before its termination, however, this variety of erysipelas sometimes assumes a lingering erratic character, wandering progressively along the skin, and spreading in one direction as it fades in another. Sometimes it disappears entirely from one part, and flies by *metastasis* to a distant one; and sometimes it quits the skin suddenly, and some internal organ is affected with an inflammation having the same constitutional characters.

The *phlegmonous* or *cellulo-cutaneous* erysipelas *may* terminate as favourably as the simple variety;—but it more generally leads to unhealthy suppuration and sloughing of the cellular tissue;—in which case the swelling becomes flaccid and *quaggy*;—patches of the skin become purple, and covered with livid vesications, and these patches slough, giving exit to a thin sanious pus, and to flakes of disorganized cellular tissue. And not only the subcutaneous, but the intermuscular tissue and fasciæ may slough, rendering the limb useless, even if the patient escape with his life. Moreover, after a very severe attack of erysipelas, the cellular tissue is apt to be left in a hardened, brawny state, through infiltration with lymph.

PROGNOSIS.—This must be *guarded* if the patient is old, enfeebled, and habitually intemperate;—if the constitutional affection is low and typhoid;—if the epidemic is of a low cast; if the malady is situated on the head or throat, and there is coma or great dyspnœa,—or if the erysipelas is of the phlegmonous variety, and a large portion of the cellular tissue and skin is on the point of sloughing. Mr. Nunneley observes, that if the frequency of the pulse is not abated by the seventh day, the prognosis will be unfavourable, even although the local symptoms appear to be improving. The return of suppuration in ulcers, and the formation of abscesses, are most favourable signs.

CAUSES.—The causes which render the constitution liable to erysipelatous inflammation are threefold. *First*, intemperance, fatigue, close confinement in foul air, and whatever other causes are capable of irritating the digestive organs, exhausting the nervous system, and vitiating the blood. The origin of erysipelas in the close air of hospitals is unhappily too notorious to need mention. *Secondly*, the disease may be *epidemic*; that is, may be produced by certain states of the atmosphere at large, affecting several people in the same district simultaneously. *Thirdly*, it may be propagated by *contagion* or *infection*, by means of emanations from patients affected with it.

These causes may be sufficient of themselves to produce the disease (which then is said to be *idiopathic*); or they may merely predispose the patient to suffer, on the occurrence of some injury to the skin, which acts as an exciting cause; such as leech-bites, caustic, and burns. Idiopathic erysipelas generally attacks the face and scalp.

TREATMENT.—The indications for the *constitutional* treatment are, to diminish febrile excitement—to support the strength—and to correct the secretions;—and for the *local* treatment, to allay irritation—to arrest the extension of the disease—and to give free exit to sloughs and discharge. But the surgeon must never forget that erysipelas varies so much in its type at different periods, sometimes requiring free antiphlogistic measures, and sometimes bark and opium, that when a new epidemic arises he must carefully study what Sydenham calls the genius of the disease, and observe the effect of remedies, in order to determine what plan of treatment is the best.*

Emetics and Purgatives.—It is always necessary to begin with what Dr. Todd calls eliminative treatment; that is, to produce a full and copious discharge of all the excretions, by which the blood is naturally purified. On the first occurrence of the symptoms an emetic should be given (F. 98), and be followed by ten grains of calomel, and by purgative draughts, every six or eight hours, as long as they bring away hardened lumps of fæces, or as long as the secretions continue to amend under their use.

Antiphlogistic measures.—*Bleeding* may be required if the patient is young and vigorous, the pulse full and strong, the face flushed, and delirium violent; and if the inflamed part is full, tense, and vividly red, and especially if seated on the head or throat. In similar active inflammatory cases, *calomel* may be given in doses of two grains every six hours with antimony (F. 62); and *saline draughts* (F. 58) in the intervals;—but in most cases of simple erysipelas a small dose of mercury at bed-time (F. 63), and purges and salines during the day, to act on the kidneys and skin, will suffice. For it must be recollected that as the disease is not purely inflammatory, it cannot be cut short by mere antiphlogistic measures; and that debility is much to be dreaded; especially in cases occurring in the crowded habitations of London.

Tonics and Stimulants.—*Bark* should be given in *all* cases as soon as the tongue becomes clean and the skin moist; but it should be resorted to without delay if the pulse is soft, tremulous, or very rapid, the heat moderate, and the delirium low and muttering, or if the patient is naturally delicate, and subject to periodic or recurrent attacks;—or if antiphlogistic measures do not arrest the disease, or if suppuration or sloughing have commenced. Wine and good nourishment will also be requisite, and it is on these that we must principally depend for the patient's safety in severe cases of any kind; and especially those attended with sloughing and profuse suppuration.

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* See also Graves's Clinical Medicine, p. 575.

Opium may be given in full doses at bed-time in the later stages, to allay restlessness, provided there is no cerebral congestion nor coma.

If there is great irritation of the stomach, with sickness or diarrhœa, small repeated doses of hydr. c. creta et pulv. ipec. c. should be given with effervescing draughts, F. 64, 58; and fomentations or rubefacients be applied to the abdomen.

And in what may be called *chronic* or *habitual erysipelas*, when it comes on at intervals, when the stomach is disordered, or the general health deranged, a course of aperients, alteratives, and tonics (especially sarsaparilla and alkalis) should be administered according to the principles laid down in the Chapter on Chronic Inflammation.

LOCAL MEASURES.—*Leeches* are useful in the early stages, provided the patient can bear the loss of blood. *Minute punctures* about one-fifth of an inch deep, made with the point of a lancet, may be used as substitutes; and often permit the discharge of considerable quantities of blood and serum. *Cold lotions may* be used when the heat is great, the redness vivid, and the pulse good. But *warm* or *tepid* poppy fomentations will generally be found more soothing, and theoretically are safer than cold applications.

Flour, dusted on the inflamed part, or soft carded cotton wool, is often very soothing in simple erysipelas.

Pressure by bandages is serviceable in the latter stage of most cases;—and from the very first, if the inflammation be atonic and œdematous.

Mercurial ointment smeared on the part, or applied as a plaster, has been much praised by some people, but its efficacy is questionable.

Stimulants.—The *nitrate of silver* in substance or solution; or *blisters*, or fomentation of dec. cydonii oj. cum. liq. am. sesquicarb. ℥j. are of great use in putting a stop to tedious erratic cases of simple erysipelas, after proper constitutional remedies have been used.

In similar cases, the *extension of the disease may sometimes be arrested* by applying a strip of blistering plaster, or still better, the nitrate of silver, so as completely to encircle the inflamed part. The skin should be well washed first, and care should be taken to leave no interstices through which the disease might creep and extend itself. When there is a tendency to sinking, with diminution or disappearance of the external inflammation, warm cloths, moistened with turpentine or sp. camp. may be applied externally, whilst diffusive stimulants are administered internally.

Incisions are, to use a French expression, the *heroic* remedy in phlegmonous erysipelas. When the swelling is great, and increases rapidly;—when it is hard, tense, and resisting, not soft and œdematous as in simple erysipelas;—when the pain is severe, and throbbing, and not relieved by leeches;—when there is the least sensation of fluctuation or *quagginess*; or when the skin is becoming livid or dusky, or covered with livid vesicles, they are imperatively demanded. They are absolutely necessary for the discharge of pus and sloughs;—for, as James observes, these matters are neither brought to the surface by pointing, nor walled in by adhesion. And they are not merely apertures for the discharge of matter; but a very effectual means of cutting short the inflammation, by relieving the tension, and by emptying the distended blood-vessels. They are also requisite in erysipelas of the throat, when great swelling threatens suffocation by pressure on the trachea. They should be made of sufficient length,—in as many places as required;—they should be carried quite deeply through the diseased tissues, and should be repeated as often as necessary. Two, three, or four inches will be a sufficient length in most cases; but it can never be necessary to gash a limb from hip to ankle. They should not be permitted to bleed long;—and hæmorrhage, if profuse, is best stopped by continued pressure with the fingers on the bleeding points. The subsequent measures are poultices, followed by nitric acid lotion; and bandages to prevent lodgment of matter and sinuses.*

SECTION III.—ERYSIPELATOUS OR DIFFUSED INFLAMMATION OF THE CELLULAR TISSUE.

Symptoms.—This disease exhibits the symptoms of cellulo-cutaneous erysipelas, without the affection of the skin. A rapidly-increasing swelling appears on one of the limbs, or on some part of the trunk. Its surface is tense, shining, and usually pale. When pressed upon, it feels in some cases hard and resisting, but more frequently it yields that peculiar, semi-elastic sensation described by the term *boggy*, or *quaggy*. There is always most excruciating pain,—which in some cases is burning and throbbing, in others heavy and tensive. The disease is invariably attended with fever of an irritative or typhoid character. The pulse is always frequent; it may be sharp and jerking, but is without strength and steadiness. The countenance is anxious and haggard;—the mind irritable and desponding, and delirious at intervals. Respiration is quick and laborious,—more especially if the disease be seated on the chest, as it frequently is,—because the pleura is affected through contiguous sympathy. In unfavourable cases, low muttering delirium, copious offensive perspiration, and jaundiced skin, usher in the fatal termination.

Causes.—The *predisposing* causes of this disease are those of the other varieties of erysipelas. The *exciting causes* may be of the most trivial nature, if the patient be predisposed; such as very slight punctures or abrasions. This is the disease which is excited by the bites of venomous serpents;—and by inoculation with septic animal poisons;—especially by that which is generated in bodies recently dead;—it also occasionally follows certain surgical operations, as lithotomy and the excision of piles. It is often combined with phlebitis.

Morbid Anatomy.—On examination of the parts affected, at an early period of the disease, the cellular tissue is found loaded with a limpid reddish serum. In a more advanced stage this fluid becomes thicker, and less highly coloured. Subsequently, the cellular tissue is found to be gorged, partly with white semifluid matter, partly with a brownish purulent sanies, which is mingled with detached flakes of the sphacelated tissue. The muscles, and other structures in the vicinity, are discoloured and softened;—and the larger veins which permeate the diseased part, have their coats inflamed, and often in a state of suppuration.

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* Vide James, op. cit.; Copland, Dict.; Higginbottom on Nitrate of Silver; Copland Hutchinson's Surgical Observations; the Lectures of Abernethy, and Cooper; and two Lectures by Velpeau, Med. Gaz., Aug. 14 and 21, 1840.

Diagnosis.—This disease is to be distinguished from the common phlegmonous abscess by its having a smooth and level surface, without any tendency to point;—also by the asthenic nature of the accompanying fever.

Treatment.—This will be more fully discussed in the Chapter on Dissection Wounds (Part iii. ch. 9). It may, however, be summarily observed, that leeches, hot fomentations, and free incisions,—emetics, purgatives, and enemata, followed by bark, opium, and wine, are the measures that are sanctioned by the most authoritative and experienced writers.*

CHAPTER XI.

OF ULCERATION.

SECT. I.—OF THE PATHOLOGY OF ULCERATION.

Pathology.—Ulceration consists in the progressive softening, and disintegration of successive layers of the ulcerating tissue.

Like mortification, it may occur in two different ways. It may either be preceded by inflammation, or not.

(1.) *Inflammatory Ulceration.*—Supposing the skin to ulcerate from the application of venereal poison, for instance. In the first place, its surface inflames, and exudes serum or unhealthy pus, which elevates the cuticle into a pimple or pustule. When the pustule is opened, there appears a little hollow, filled with a whitish or greyish tenacious matter, consisting of the substance of the skin itself, which has lost its vitality and is about to separate, and of lymph or of unhealthy flaky pus with which it is infiltrated. If this is wiped off, the surface underneath is seen to be red, and it easily bleeds. Supposing the case to proceed, there is formed a chasm, eaten into irregular hollows, with intervening red eminences, which easily bleed if touched; its edges are ragged, loose, and undermined; the surrounding skin red, hot, and swollen; there is a thin serous, or bloody discharge, and a constant, severe gnawing pain. An ulcer having these characters may always be considered as extending itself.

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* Vide two papers in the Edinburgh Medical and Surgical Journal for 1825, vol. xxv.; Copland's Dict. *Art.* Cellular Tissue; James on Inflammation; Travers on Constitutional Irritation, and Butter on Irritative Fever, Devonport, 1825, which gives an account of an extraordinary visitation of this disease in Plymouth dock-yard in 1824.

An *excoriation* is often the first stage of this kind of ulcer; that is to say, a portion of skin inflames, loses its cuticle, and discharges matter, and the excoriated portion may either heal, or, as we have just observed, may ulcerate.

Of course, ulcers spread with varying degrees of rapidity. An attack of violent inflammation may cause the death of a considerable portion of the affected tissue in a very short time; then there is said to be a *sloughing ulcer.* When an ulcer spreads very rapidly, but regularly and without sloughing of any great portion at one time, it is called *phagedænic.* And when it spreads more rapidly still, not by one fit of sloughing, but by the constant reiterated mortification of considerable layers, the disease receives the name of *sloughing phagedæna.*

(2.) *Congestive Ulceration.*—This may be very briefly described as it occurs on the legs of old dropsical people. A small portion of skin has its capillaries distended with venous blood, whose return is nearly or quite suspended. Some of the serum (with which the cellular tissue is already distended) exudes under the cuticle, raising it into a blister. When this is removed, there is seen a darkish layer of sloughing skin. This, like the last, may spread with every degree of rapidity; but whether a large tract of skin mortifies at once, or whether the smallest portion ulcerates, the process is one and the same.

(3.) *Combination of the two Forms.*—But it most generally happens that ulceration consists in a combination of inflammation and congestion; that is, in the inflammation of a part already congested, or incapable, through weakness, of supporting inflammation without loss of life.

As this account which we have given of the ulcerative process differs very materially from the doctrines of Hunter, it is necessary to say a few words in proof of its correctness.

Now Hunter taught, that ulcers are formed by a variety of absorption, which he denominated ulcerative; the substance of his theory being, that the ulcerating tissue, feeling its want of vitality, causes itself, as a last act of life, to be absorbed by its own lymphatics.

But to this doctrine it must be objected, first of all, that it is void of all proof. Hunter says that it is so, and that he was the first to show it, but nowhere does he attempt to prove it.

And secondly, whoever will take the trouble to watch the first beginnings and progress of a spreading ulcer, may have ocular evidence that the loss of substance is through disintegration.*

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* The former editions of this work contained a copious array of arguments on this question, but it is not necessary to repeat them now, since it may be considered as settled. For further information, consult Mr. Gaskell's MS. Jacksonian Prize Essay on Ulceration, in the Library of the College of Surgeons

It will be noticed in its proper place, that bone and cartilage sometimes ulcerate by disintegration, sometimes are removed by a peculiar solvent power of the textures in contact with them.

PREDISPOSING CAUSES.—The *Tissues* most disposed to ulceration are the skin, with the mucous and synovial membranes. From these it may spread to other subjacent tissues, which yield to it with varying degrees of rapidity. The cellular tissue ulcerates very easily; but muscles, blood-vessels, and nerves, very slowly; so that they often appear to be as it were dissected out in spreading sores, by the destruction of the cellular tissue around them. Tendons and ligaments are also very slow to ulcerate; but cartilage, bone, and the cornea are in certain constitutions extremely liable to it.

The *Constitutions* most liable to ulceration, are those which are debilitated by intemperance or privations;—tainted with syphilis or scrofula;—or broken down by the excessive use of mercury.

The *parts* most disposed to it are those whose circulation is most weak and languid; such as the lower extremities; and more especially if the return of their venous blood be in any way impeded by a varicose state of the veins. On this account tall persons are much more frequently affected with ulcers of the legs than the short. Sir E. Home shows, on the authority of Dr. Young, that twenty-two out of one hundred and forty-five tall men, and only twenty-three out of two hundred and seventy-six short men, were discharged from a regiment in the West Indies in four years, on account of ulcers.

Defect of nervous influence may cause parts to lose their vitality, and ulcerate or mortify. Ulcers of the cornea have followed injury to the fifth, and ulceration of the hand has followed injuries of the median nerve.*

Adventitious tissues, such as fibrous and cancerous tumours, are particularly liable, after a time, to lose their vitality and ulcerate.

EXCITING CAUSES.—In constitutions or parts predisposed to it, the slightest irritation may be sufficient to excite ulceration. In the healthy it may be produced by the continuous application of some irritant, so as gradually to exhaust the vital powers of the part;—such as continued pressure; the presence of irritating fluids, or depraved secretions. But it is not easy to excite genuine spreading ulceration in the healthy, unless by some specific cause, such as the venereal poison.

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in London, and the preparations accompanying it; also J. W. Earle, Med. Gaz. for 1835; C. Aston Key, Med. Chir. Trans., vol. xviii. and xix.; Copland, Dict. Pract. Med. *Art.* Inflammation; Pearson's Principles of Surgery; and particularly Wallace on the Venereal Disease, Lond. 1838, p. 47. Writers sometimes confuse the absorption, which they pretend to be the cause of ulceration, with the absorption of fluids from the surface of an ulcer. Thus the formation of bubo is sometimes alleged as a proof that chancre is caused by ulcerative absorption. If it were so, the bubo would come whilst the chancre is forming; instead of which, it seldom occurs till it is beginning to heal and to become more capable of imbibing its own poisonous secretions, and transmitting them into the veins and lymphatics.

* See cases quoted by Paget from Swan, and Hilton. Med. Gaz. N. S. vol. iv. p. 1023.

SECTION II.—OF THE VARIETIES OF ULCERS.

Definition.—It is not easy to give a rigorous definition of the term ulcer, nor is it necessary. For all useful purposes, it will suffice to say, that it signifies a chasm on the surface of any organ caused by the destruction of a portion of its substance by disease ; or by an injury which has not been repaired.

Ulcers present many varieties, which may be classed under three heads. 1. *Healing.*—They may be in a state tending to reparation ; as the healthy ulcer. 2. *Stationary.*—Their surface may have an imperfect form of organization, under which they may be incapable of healing, though they are not necessarily spreading ; the weak and indolent ulcers are examples. 3. *Spreading.*—They may be under the influence of the destructive process which formed them originally, and which is still causing them to spread ; as the phagedænic.

I. THE HEALTHY OR HEALING ULCER is nothing more than a healthy granulating and cicatrizing surface. The granulations are small, numerous, florid, and pointed, and yield a moderate secretion of healthy pus. The edges are smooth, and covered with a white or bluish semi-transparent pellicle, which is gradually lost on the margin of the granulations.

Treatment.—The only treatment required will be a little dry lint, if there be much discharge,—or the water-dressing, or simple ointment, if there be not. If there be not much discharge, the dressings should not be changed more frequently than every second or third day. If the granulations are too luxuriant, they may be touched with lunar caustic, and dressed with dry lint. If the granulating surface is very extensive, or if all applications disagree with it, as sometimes happens, it will be expedient to form a *scab* on its surface. This may be done by allowing the pus to dry, or by sprinkling a little flour, or calamine, or chalk, to absorb it. But the best plan in these cases is to pass a stick of lunar caustic over the surface of the sore, as recommended by Mr. Higginbottom. This salt instantly coagulates the fluids on the sore, and forms a white pellicle, which soon becomes dry and black, and is much less irritating than an ordinary scab. If the scab act favourably, suppuration ceases, and cicatrization will be found complete when it is detached. No other dressing is required, except a piece of gold-beater's skin, and a slight bandage, to prevent injury. If pus continue to be formed, a small hole should be made in the middle of the scab to let it out.

II. THE INFLAMED ULCER has already been described.

Causes.—Ulcers (though not originally formed by inflammation) are liable to inflame from any of the ordinary local or constitutional causes, especially errors in diet. Sores situated over projecting parts of bones or ligaments, as the outer ankle, or over the bellies of muscles, are apt to assume this character ; hence care should be taken to avoid making issues in such situations.

Treatment.—In a few instances, when the patient is very plethoric and strong, it may be expedient to bleed, and to administer calomel, antimony, and opium, till the mouth is slightly affected. In all cases, reiterated doses of active purgatives should be given, the urine be examined, and the diet be regulated. The patient should be kept in bed, with the limb raised on a pillow, and covered only with a sheet, in an elevated posture. The part should be fomented night and morning for half an hour with poppy fomentations, and then a poultice or the water-dressing be applied, or the steam-bath described at p. 41 may be tried ;—and if the pain be very severe, the poultice may be medicated with opium (F. 157), or conium or poppy. If the discharge be very offensive, a weak lotion of chloride of lime, or chloride of zinc, may be applied on lint under the poultice. If the ulcer diminish under these applications, but yet its surface remain foul, they may be continued till it is healed ; but if the surface become healthy, it may be treated as an ordinary ulcer.—If warm applications aggravate the pain, cold evaporating, or saturnine lotions (F. 115, &c.) should be used, the sore being protected by a piece of oiled silk or simple dressing ; or it may be irrigated after the plan described at p. 40.

If all these soothing measures prove ineffectual, as they occasionally will, even though aided by the most judicious constitutional treatment, recourse must be had to the measures directed for irritable ulcers.

III. The Irritable Ulcer is a variety of the inflamed. The granulations are small, and are morbidly sensitive and vascular.

Treatment.—In the first place, the constitution, which is generally out of order, must be corrected by alteratives and tonics. Plummer's pill, or F. 62, 63, 64, at bedtime ; and sarsaparilla, soda, and hyoscyamus, F. 82, &c., during the day ; or the extract of conium in doses of gr. v., ter die, will be of great service.

In the local treatment, all sources of irritation must be removed, and the soothing applications directed for the inflamed ulcer may be tried first. But the most successful plan, generally speaking, is the application of a succession of mild stimulants, so as to alter the actions and exhaust the irritability of the part. Weak lotions of nitric acid (F. 119), of nitrate of silver (gr. i. ad ℥j.), of arsenic (F. 124), of sulphate of zinc (gr. i.—v. ad ℥j.), of sulphate of copper (gr. i.—ii. ad ℥j.), of acetate of zinc (F. 136), of corrosive sublimate (F. 141), of chloride of soda, of iodine (F. 90), the linimentum æruginis, black wash (F. 125), yellow wash (F. 126), lime water, solution of sulphate of iron (gr. i. ad ℥j.), *forge water*, that is, water in which red-hot iron has been extinguished, strong green tea, powdered chalk or charcoal mixed with cream, ointments of Peruvian balsam, of oxide of zinc, chalk, lead, and calamine ; weak mercurial ointment, liniment of ung. hydr. nitratis ; moderate pressure with strips of soap plaster, or of linen spread with soap cerate, or with a smooth piece of sheet lead ; all these measures will occasionally be of service in the cure of obstinate and irritable ulcers. For it very often happens that an application which at first soothes the pain will soon lose its good effects, and then become positively hurtful.

IV. The Weak Ulcer has large, pale, flabby, and insensible granulations rising above the margin of the skin, and showing no disposition to cicatrize. The constitution in which such an ulcer occurs is torpid and weak.

Treatment.—The indications are to augment the vital forces of the granulations, and to restrain their exuberant growth, by a liberal diet and tonics, and mild stimulating applications. Such are—fine dry lint, which by itself is an excellent stimulant; or lint, dipped in a lotion of sulphate of zinc, or of sulphate of copper, or of nitrate of silver, or the ung. hydr. nit. (F. 173). The formation of a crust or scab with the lunar caustic, on Mr. Higginbottom's plan, may be often resorted to with advantage. In some cases a scab may be formed by covering the sore with powdered rhubarb. At the same time, pressure by means of strips of plaster, or compresses, and bandages, are necessary to prevent languor of the circulation;—especially if the muscles are wasted and flabby. If the patient is young and weakly, with great coldness and blueness, and tenderness to œdema in the extremities, the limb may be immersed in tepid salt water for fifteen minutes twice a day.

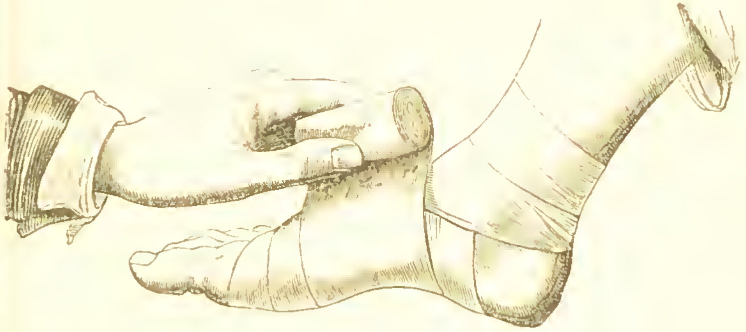
V. The Indolent Ulcer has its surface smooth and glassy, and of a pale ashy colour, like a mucous membrane. Sometimes, however, it displays a crop of weak fungous granulations. The edges are raised, thick, white, and insensible; the discharge scanty and thin. The most frequent *situation* of these ulcers is the small of the leg, and they are almost exclusively met with amongst the lower orders. They are often stationary for a great length of time; but from any slight cause of irritation, may enlarge rapidly by ulceration or sloughing; and even when they have made considerable progress in healing, the granulations and cicatrices that have been months in forming may perish in a few hours from some constitutional disturbance or local injury.

Treatment.—The general rules are, to promote constitutional vigour by good diet and tonics, to excite the local actions by various stimulants, and to support the venous circulation in the affected part.

The following is perhaps the best plan of curing these ulcers. A number of pieces of lint, thoroughly soaked in the nitric acid lotion, should be laid on the sore, and be covered with a warm soft poultice. These applications should be changed twice a day, and be continued till the discharge becomes healthy, and granulations begin to arise. During this time the patient should be confined to bed and be purged. Afterwards, when the surface is clean, the following mode of dressing may be adopted. First, some pieces of lint, saturated with the nitric acid lotion, or zinc lotion, or with some other stimulating substance, should be laid on the sore. Then strips of adhesive plaster, about 1½ inch wide, should be applied *two-thirds round the limb*, from an inch below the ulcer to an inch above it; and in applying each strip, the edges of the sore should be drawn together with a moderate degree of force. Next, a compress of soft linen should be placed over the plaster, and finally, the limb should be well and evenly bandaged from the toes to the knee; observing that the bandage is to be applied most tightly below, and more loosely by degrees as it ascends.

The frequency with which the dressings should be changed, must depend on the state of the discharge; for if that be profuse they should be changed every day; otherwise from twice to four times a week will suffice.

One thing scarcely noticed by writers, but perhaps of more consequence than most plasters, is the observance of *perfect cleanliness.* When it is considered how filthy the habits of many persons are, who often leave their legs and feet unwashed for weeks and months together, it cannot be wondered that skin so neglected should, in the decline of life, possess a very imperfect vitality; and the author is convinced by experience, that daily washing the lower limbs with a piece of flannel and yellow soap and water, is one of the best means of reviving their decayed powers.



During this plan of treatment, the patient may, after the first few days, walk about moderately; but he should not stand about, nor sit with the leg hanging down.

If the common strapping irritate the skin, the empl. plumbi, spread upon cheap thin *split* leather, or the isinglass plaster will answer better.

But although the plastering and bandaging are adapted for most cases, the immediate application to the ulcer will require to be frequently varied. Sometimes the strapping may be applied without anything else; or dry lint may be placed under it; or lint imbued with lotions of sulphate of copper, or alum; or with lotions made by adding half an ounce of the tincture of myrrh, or of benzoin (comp.), or aloes (comp.), to four ounces of water; or the balsams of copaiba or Peru; but metallic preparations agree better in general than the vegetable. The author fancies that resinous lotions and ointments are best, when the skin is irritable, and *eczematous*, or covered with scales of cuticle which readily peel off. In such cases plasters cannot be borne. Arsenic may be serviceable, F. 97. Ointments agree better with the indolent than with the other varieties of ulcer, because they do no harm if rancid. The ung. hyd. nitric. oxid. is very useful ;—and the ung. hydrarg. nitrat. dilut. is praised for its efficacy in reducing thick callous edges.

Particular Plans of Treatment.—From the middle of the last century, when the surgeons of St. Thomas's Hospital were in treaty with an apothecary in Half Moon Street, for the purchase of an infallible method of healing ulcers, or rather from time immemorial to the present, the multitude of plans recommended for the treatment of ulcers, shows but too truly that they all often fail. Baynton's plan consisted in the application of strips of plaster completely round the limb, from an inch below to an inch above the ulcers.* Mr. Syme covers an indolent ulcer with a blister, which he finds an excellent method of reducing callous edges and œdematous granulations, and in exciting the vitality of the part. Mr. Stafford recommends old deep indolent ulcers to be treated by filling up their cavity with a mixture of one part of Venice turpentine, and four of bees' wax, melted, and poured in warm. M. Malgaigne is said to use in some cases a warm iron held at a little distance from the ulcer, so as to dry its surface.† The same object is sometimes attained by the application of heated air. Mr. John Scott devised a plan, which has been revived by Mr. Critchett, and by which a very effectual support is given to the vessels of the affected limb, by strips of mild adhesive plaster, applied so as to encase the limb from the foot upwards. This is likely to be of great service when all the veins are dilated, and the cellular tissue spongy. Mr. G. H. Walker uses with success a fumigation of the vapours of iodine and sulphur, as recommended by Dr. Burgess.

The student may comfort himself by noticing that the essence of every successful plan is, a combination of some mild stimulant to the ulcer, and of efficient support to the weakened vessels of the leg. Whoever attends to these points, and to the constitution likewise, will soon learn how to do all that surgery can accomplish. During any febrile disturbance of the system, the local applications must be mild.

Should old ulcers be healed?—The propriety of healing old ulcers will sometimes be made a question, inasmuch as certain diseases, and especially apoplexy, palsy, and mania, are apt to supervene on their suppression. Sir E. Home has specified the following cases in which a cure ought not to be attempted. 1. If the ulcer be "evidently affected with the gout, having regular attacks of pain, returning at stated periods; and those attacks similar to what the patient has experienced from gout in other parts." 2. If an ulcer habitually occur whenever the constitution is disordered. 3. If the patient be very infirm and old; for under these circumstances the removal of an habitual source of irritation, or the diversion of an habitual afflux of blood, may prove fatal;—more especially as very old ulcers have been known to heal spontaneously a short time before death.

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* Baynton, T., Descriptive Account of a New Method of Treating Old Ulcers of the Legs. Bristol, 1797.

† Burnes, Lancet for 1847, vol. i.; Critchett, James Arnott, Chapman and others in Lancet for 1848 and 1849.

To these cases must be added that of ulcers on the legs of stout women, about the critical time of life, and displaying a tendency to discharge copiously as the periodic uterine flux diminishes.

In any case we may observe, 1, that even if an habitual ulcer has not displayed any connexion with constitutional disorder, the secretions of the liver and kidney should be well kept up during the cure and for some time after it. 2. That if, spite of this, there be symptoms of congestion in the head, an issue or a seton in a convenient situation will answer the purpose of an ulcer in an inconvenient one; and, therefore, that with these safeguards ulcers on the legs may always be healed, if possible.

Whately* mentions a case in which an ulcer was healed, but some time afterwards it reappeared of itself, and soon after that the patient died suddenly; and, he observes, if his death had happened before the second breaking out of the ulcer, it would infallibly have been attributed to the healing of it.

VI. THE FISTULOUS ULCER (*Fistula* or *Sinus*) is a variety of the indolent, and consists of a narrow channel lined by a pale pseudo-mucous membrane, which may or may not lead to a suppurating cavity. In old cases the parietes of the tube are often dense and semi-cartilaginous.

Causes.—Fistulæ are produced when abscesses are not thoroughly healed from the bottom, when there has been a defect in the bandaging or in providing proper outlets for the discharge; or when there is some standing cause of irritation, as a ligature, or a piece of dead bone, which keeps up a discharge of pus.

Treatment.—The first indication is to remove any source of irritation—diseased bone, for example—that may happen to exist, and diseased bone should always be looked for. The second, to prevent the lodgment of matter; for which purpose it may perhaps be necessary to make another opening. The third indication is to produce the adhesive inflammation. The means to be adopted are, stimulating injections, tents smeared with irritating ointments; the caustic bougie; or a seton consisting of a few threads of silk, which may be passed through the fistula, and may be gradually diminished as the passage contracts. At the same time, the sides of the fistula should be kept constantly pressed together with compress and bandage. If these means fail, the fistula should be slit up with a bistoury; and then a thin piece of lint be introduced in order to prevent premature union of the cut edges, and make it heal from the bottom.

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* Whateley, T., Practical Observations on the Cure of Wounds and Ulcers. Lond. 1816, p. 144.

If there have been a succession of small unhealthy abscesses in a part;—or if ulceration have spread irregularly in the cellular tissue, so as to leave the skin ragged, and extensively undermined with tortuous sinuses, it may be advisable to destroy the whole of the parts so diseased by the potassa fusa; and this will stimulate the neighbouring sound parts, so that when the slough separates, a healthy surface will be left, which may be healed by the ordinary means.*

VII. THE VARICOSE ULCER occurs in consequence of a varicose state of the veins of the lower extremity. This greatly impedes the return of blood, and, by producing habitual venous congestion, weakens the parts, and renders them prone to ulceration. The ulcers are usually three or four in number; situated above the ankle. They are oval in shape, indolent in their progress, and neither extensive nor deep;—but they are attended with considerable pain, which is of a deep-seated, aching character.

The *Treatment* must be directed principally to the veins, and for this, we must refer to the chapter on that subject. We will merely observe here, that the applications to the ulcers must be suited to their condition, whether irritable or indolent;—and that great relief to the pain is frequently obtained by opening one of the enlarged vessels, and abstracting a moderate quantity of blood. The advantages of proper support by bandages or laced stockings, or by encasing the limb in strapping from the foot upwards, according to Mr. Critchett's plan, need scarcely to be noticed. Sometimes there is a constant desquamation of the cuticle, with serous discharge, for which the best remedies are equal parts of lime-water and milk, or the ointment of chalk (F. 164), or of oxide of zinc, or F. 131, or 188.

VIII. The SLOUGHING ULCER is formed whenever either of the other varieties of ulcer is attacked with sloughing:—which is particularly liable to occur to the *indolent*, when subjected to undue irritation. Or, this name may be given to ulcers originally produced by a sloughing of the skin;—as on the legs of the dropsical.

Treatment.—The best applications are warm fomentations of poppy decoction, to which a little spirit has been added; poultices of yeast or carrots; or the nitric acid or chloride of lime lotion on lint, with a warm poultice over it. The gastric juice of animals is said to be a specific for certain sloughing ulcers occurring in persons debilitated by the use of ardent spirits and salt provisions, and by residence in hot climates.

IX. PHAGEDÆNA is a peculiar variety of ulceration, extremely rapid in its progress. The surface of the sore is irregular, generally whitish or yellowish; the discharge serous or bloody, and often extremely profuse; and the pain extreme. Some cases are attended with fever and acute inflammation, the margin of the sore being highly painful, swelled, and red;—others with atony and debility, the margin being pale, dusky, or livid.

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* Liston, Elements of Surgery.

Causes.—This disease may be induced either by extraordinary local irritation, or by some peculiar constitutional disorder. It may attack primary or secondary venereal sores in consequence of filth, intemperance, the abuse of mercury, or of a weakened and vitiated, or scrofulous habit, or of some peculiarity in the venereal virus. Sometimes it appears in the throat after scarlatina;—it may attack a blistered surface when the constitution has greatly suffered from an acute and exhausting disease, as measles, &c.;—sometimes it affects the mouth or genitals of children, constituting *cancrum oris, noma*, &c.

Treatment.—If the habit is inflammatory, and the pulse full and strong, bleeding and the antiphlogistic regimen should be employed, and opiate lotion be applied to the sore. If the condition of the system is the reverse, tonics and narcotics (F. 1, 2, 3) should be administered, and the diseased surface should be destroyed by nitric acid in the manner to be presently described.

X. SLOUGHING PHAGEDÆNA, or HOSPITAL GANGRENE, seems, says Mr. Lawrence, to be the state of phagedæna carried to its fullest extent. Its *causes* are, (1) *great local irritation*, combined with a vitiated state of the constitution. (2) *Contagion ;* that is, the application of poisonous matter to a wound; and (3) *infection ;* that is, the reception of poisonous miasmata into the blood. We shall first treat of it as it occurs sporadically in civil practice, where it bears the name of *sloughing phagedæna ;* and next, of those more serious visitations that decimate the patients in crowded naval or military hospitals, whence it derives its other name, *hospital gangrene.**

In the cases seen in civil practice, the disease is mostly seated in or near the genital organs; in the cleft of the nates, in the groin, or at the upper and inner part of the thigh. It often, but far from invariably, supervenes on syphilitic ulcers; especially in young prostitutes, who have been exposed to cold and wet, and privation of solid food, and the abuse of ardent spirits. It is especially liable to be induced by the too free administration of mercury, or by intemperance and exposure to wet during a mercurial course. The worst cases, however, appear to arise from neglected local irritation, without any specific virus; as from acrid discharges and defective cleanliness. Mr. Lawrence mentions the case of a young woman who had suffered from severe small-pox, and from diarrhœa after it. The continual moisture from the rectum, with a mucous discharge from the vagina, irritated and inflamed the skin of the nates, and caused a large sloughing phagedænic excavation on both sides.

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* In civil hospitals any serious attack of hospital gangrene is almost unheard of. Yet, it occasionally threatens to appear. Thus, Mr. Liston says in 1844, of a stump that was healing kindly in University College Hospital, that all of a sudden it assumed a carious appearance; became enormously swollen, and profuse hæmorrhage took place. "Not many days passed before a number of other wounds assumed the same appearance ; the parts got puffy around them ; the discharge became slimy and tenacious, very putrid, and bloody fœtid gas filled the cellular tissue around them. They extended rapidly, presenting a circular form."—Lectures in Lancet for 1845, vol. i. p. 57. Mr Arnott witnessed three cases in the Middlesex Hospital in 1835. Quoted in South's Chelius, vol. i. p. 67. The disease appeared in St. Bartholomew's Hospital and in St. George's in 1847. C. Hawkins, Med. Gaz. N. S. vol. iv. p. 1026. An account of its ravages in the British camp after the battle of Ferozepore, by Mr. Taylor, Surgeon to the 29th Regt., is quoted by Guthrie, Lancet, 1848, vol. ii. p. 714.

Symptoms.—" It usually commences as a highly irritable and painful boil, surrounded by a halo of dusky red inflammation, and much elevated; the patient also in general having mucous discharges from the vagina, and a diffused redness of integument in the vicinity of the pudenda." There are severe darting and stinging pains, which are at first intermittent, but gradually establish themselves as a constant symptom, with occasional exacerbations. When the pustule is ruptured, the exposed surface of the ulcer displays a stratum of adherent straw-coloured flocculi, mottled with darker points of reddish brown and grey. The sore thus formed soon enlarges in breadth and depth; —the edges become everted, and attended with a circumscribed thickening, which is surrounded by dusky inflammation and diffused puffy swelling. The surface is composed of grey or ash-coloured sloughs, which may become brown, or resemble coagula of blood. The discharge is reddish-brown, and peculiarly fœtid, and there is occasionally severe hæmorrhage. Meanwhile the agonizing pain, the hæmorrhage, and the absorption of putrid matters, soon induce severe irritative fever,—ushered in by loss of sleep, anxiety, restlessness, and thirst; which, with an exhausting diarrhœa, produce death in about three weeks; and, as delirium is rare, the patient retains a miserable consciousness of severe suffering till the end. This disease is *highly contagious*, but it appears to be a *local* disease, and both the constitutional and local symptoms may be removed by measures which destroy the acrid secretions of the ulcer.*

HOSPITAL GANGRENE is the name given to this affection when occurring in military and naval practice. It is engendered by crowding together a number of sick and wounded men ; and by inattention to cleanliness and ventilation. It frequently is a concomitant of dysentery or typhus, originating in the same sources. It may affect any kind of wound, or even a mere bruise.

Propagation.—This disease, when once generated, may either spread by *contagion ;* that is, by the *contact* of its morbid secretions ;—or by *infection ;* that is, through the medium of its vapour or effluvium. It may, although rarely, occur *sporadically ;* that is, may be induced in isolated cases by improper and irritating local and constitutional treatment of the wounded.

Symptoms.—According to Mr. Blackadder, it begins in the form of a livid vesicle at the edge of a wound or sore, accompanied with an occasional painful sensation like the sting of a gnat. Sometimes it first appears as a small livid spot on the sore, and near its circumference. In either case the disease soon spreads, and converts the whole surface of the ulcer into an ash-coloured or blackish slough. The discharge, if previously healthy, is at first diminished in quantity, and sanious; —but soon becomes profuse, dirty-yellowish or brown, and, as Dr. Boggie observes, of a peculiar smell. According to Mr. Blackadder, the hospital gangrene is at first a purely *local* affection, like the sloughing phagedæna;—and he says that the constitutional symptoms (typhoid fever, &c.) do not make their appearance before the third or fourth, sometimes not till the twentieth day.*

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* Welbank, Med. Chir. Trans. vol. xi. ; Lawrence, Lectures in Med. Gaz. vol. v.

Dr. Hennen's Account.—The following quotations, however, from Hennen, display a slight variation from Mr. Blackadder's account. "Let us suppose," says Dr. H., "that our wounded have all been going on well for several days, when suddenly one of our most promising patients complains of severe pain in his head and eyes, a particular tightness about the forehead, loss of sleep, and want of appetite, and that these feelings are accompanied with quickness of pulse, and other symptoms of fever; his wound, which had been healthy and granulating, at once becomes tumid, dry, and painful, losing its florid colour, and assuming a dry and glossy coat. This is a description of the first stage of our Bilboa hospital gangrene, and if a brisk emetic were now exhibited, a surgeon, not aware of the disease that was about to form, would be astonished at the amelioration of the sore, and the unusual quantity of bile and of indigested matter evacuated by vomiting."—"If this incipient stage was overlooked, the febrile symptoms soon became aggravated; the skin around the sore assumed a higher florid colour, which shortly became darker, then bluish, and at last black, with a disposition to vesicate; whilst the rest of the limb betrayed a tendency to œdema. All these threatening appearances occurred within twenty-four hours; and at this period the wound, *whatever might have been its original shape, soon assumed the circular form.* The sore now acquired hard prominent ragged edges, giving it a cup-like appearance, with particular points of the lip of a dirt-yellow hue; while the bottom of the cavity was lined with a flabby, blackish slough. The rapid progress and circular form were highly characteristic of hospital gangrene."—"The discharge in this second stage became dark-coloured and fetid, and the pain extremely poignant."—"The face of the sufferer assumed a ghastly, anxious appearance; his eyes became haggard, and deeply tinged with bile; his tongue loaded with a brown or blackish fur; his appetite entirely failed him, and his pulse was considerably sunk in strength, and proportionably accelerated."—"The third and last stage was now fast approaching. The surface of the sore was constantly covered with a bloody oozing; and on lifting up the edge of the flabby slough, the probe was tinged with dark-coloured grumous blood, with which also its track became immediately filled ; repeated and copious venous bleedings now came on ;" —" at length an artery sprung, which, in the attempt to secure it, most probably burst under the ligature."—" Incessant retchings soon came on, and, with coma, involuntary stools and hiccough closed the scene." *

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* Observations on Phagedæna Gangrenosa. By H. Home Blackadder. Edinburgh, 1818.

It thus appears, by collating the observations of these two military authorities, that the hospital gangrene may either be a *local disease*—being produced by local contamination of a wound, and existing for some days before the system at large is affected by it ;—or it may be *constitutional* from the first ;—that is, may be induced by the absorption of poisonous miasmata into the blood ; in which latter case the constitutional symptoms precede the local mischief.† In fact, the ordinary constitutional symptoms of hospital gangrene might be induced in the nurses and attendants on the sick, from washing the bandages, and from general exposure to noisome effluvia, without being followed by any local affection whatever.

Treatment.—The indications in the treatment of all the forms of sloughing phagedæna, are, 1, to destroy the diseased surface and its secretions ; — and, 2, to correct the concomitant disorder of the system.

The first indication is to be carried into effect by means of caustics. The French use the actual cautery, Mr. Blackadder recommends the liq. arsenicalis, Dr. Boggie the red precipitate, M. Velpeau a lotion of two drachms and a half of citric acid to an ounce of water : ‡—but the concentrated nitric acid used in the following mode, as directed by Mr. Welbank, seems to be the best. In the first place, the sore must be thoroughly cleansed, and all its moisture be absorbed by lint or tow. If the sloughs are very thick, they may be removed by means of forceps and scissors. The surrounding parts must next be defended with a thick layer of ointment, then a thick pledget of lint, which may be conveniently fastened to the end of a stick, is to be imbued with the acid, and to be pressed steadily on every part of the diseased surface till the latter is converted into a dry, firm, and insensible mass. This application of course causes more or less pain for the moment, but, when that subsides, the patient expresses himself free from his previous severer sufferings. The part may then be covered with simple dressings, and cloths wet with cold water. " It is always prudent, often necessary," says Mr. Welbank, " to remove the eschar at the end of sixteen or twenty hours; and then, if the patient be free from pain, and the ulcer healthy and florid, it is to be treated with common stimulating dressings;—such as cerat. calaminæ, or solution of argenti nitras;—or a cerate of turpentine, which may be melted and poured in warm." If, however, there be any recurrence of pain, or the least reappearance of the disease, the acid is again and again to be applied till a healthy action is restored.

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* Principles of Military Surgery. By John Hennen, M.D., F.R.S.E., 3rd ed. London, 1829, pp. 217, *et seq.*

† Of the various writers on Military Surgery, Pouteau, Rollo, Ollivier, and Copland Hutchinson believe the disease to be primarily local ; Thompson and Sir James M'Grigor believe it occasionally constitutional in its origin. Their opinions are quoted in Sir G. Ballingall's Military Surgery.

‡ Dr. Boggie's observations on Hospital Gangrene, Edinburgh, 1848 ; Velpeau, Lancet, 1848, vol. ii. p. 172.

As for the general treatment;—if the constitution is not affected, opium may be given to allay the pain caused by the disease, and by the application of the escharotic; the bowels should be opened, and the diet regulated so as to support the strength without exciting feverishness.

But if the disease, as observed by Hennen, begin with fever of an inflammatory type, and the patient be robust, and the local inflammation intense, a moderate blood-letting may be performed with advantage; with an emetic, purgatives, and the antiphlogistic regimen generally. Mercury is for the most part highly pernicious.*

If, however, the constitutional affection assume a low or typhoid type, either from the beginning or subsequently, the principal dependence is to be placed on opiates, tonics, and wine, in order to allay irritation and support the strength, keeping open the bowels by cordial laxatives. If there be much diarrhœa, bark will be hurtful.

Prevention.—We may refer to the remarks on the prevention of erysipelas, at p. 63.

XI.—MALIGNANT PUSTULE (Charbon) is a contagious and very fatal disease common in France, but almost unknown in England. It commences as a little dark red spot, with a stinging or pricking pain, on which there soon appears a pustule or vesicle seated on a hard inflamed base. When this is opened, it is found to contain a slough, black as charcoal; and the sloughing rapidly spreads, involving skin and cellular tissue, and sometimes the muscles beneath.

The account given of this malady by the continental writers is exceedingly confused; but it appears certain, that it is caused by infection or contagion from horned cattle, which at certain seasons are affected with a precisely similar disease; and it further appears that, like hospital gangrene, it may commence in two ways:—

1st. By general infection of the system, from respiring air loaded with miasmata from diseased animals; or from eating their flesh. In this case it commences with constitutional symptoms; and it is this form which is more particularly styled *charbon.*

2ndly. By inoculation of the diseased fluids; and in this case the local symptoms begin before the constitutional. Mr. Lawrence gives an account of a man in Leadenhall Market, who accidentally smeared his face with some stinking hides from South America. The part touched by the putrid matter very soon became red, and swelled, and mortified, and the mortification spread over half the cheek. He has also met with two other cases affecting persons in a horse-hair manufactory. It is believed that flies which have alighted on the ulcers of the diseased animals, convey the virus, and infect other animals and human beings.

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* Babington says, that it may be employed with advantage, if the surrounding inflammation be vivid and intense. On Sloughing Sores, Lond. Med. Jour. vol. lvii. p. 204, and vol. lviii. p. 288.

The constitutional symptoms and morbid appearances are those of putrid typhus ; the treatment, both constitutional and local, is the same that we have directed for hospital gangrene.*

XII. MORBID ULCERS.—Under this term Sir E. Home includes a variety of ulcers connected with a disordered state of the constitution, and capable of being removed by particular remedies. Arsenic is said by Mr. Eccles† to be highly useful in sores which are dry and little inflamed, and surrounded by much scabbing and exfoliation of the cuticle. Ulcers about the instep and foot, with their edges and the surrounding skin much and extensively thickened like elephantiasis ; and often occurring in the lazy and over-fed servants of the opulent ; sometimes yield to mercurial fumigations, or the application of mercurial ointment with camphor.

XIII. THE CUTANEOUS ULCER spreads widely but superficially over the skin, and often heals in one part whilst it spreads to another. Some ulcers of this kind are contagious.

Treatment.—Any constitutional disorder must be ascertained and remedied. The best local applications are stimulants, especially the arg. nit., employed in solution, or rubbed lightly over the sore, so as to form an eschar.

XIV. THE ULCER OF THE CELLULAR MEMBRANE,—which burrows under the skin and destroys that tissue, must be treated as the fistulous or weak, according to circumstances.

XV. MENSTRUAL ULCER.—This name is given to ulcers occurring in chlorotic young women, and exuding a sanguineous fluid at the time of their monthly discharge, if that be absent. Wounds made in operating will frequently do the same.

Treatment.—The amenorrhœa must be remedied by steel, aloes, &c. and the ulcer be treated on general principles. Mr. Critchett has observed that the best way of making the uterus resume its functions, is to heal the ulcer, which acts as a vicarious organ; and that it is not prudent merely to attend to the general health, and neglect the ulcer.

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* Lawrence, Med. Gaz., vol. v. p. 392 ; Dic. de Méd. *Art. Charbon, Pustule maligne;* Schwabe, Brit. and For. Rev. vol. vii. p. 550. A case of anthrax, caused by eating the flesh of an animal which had died of the disease, is quoted from an Italian journal in Lond. Med. Gaz., 21st Oct. 1842 ; and there is a very convenient collection of the most recent information on the subject in South's Chelius, vol. i. p. 65.

† Eccles on the Ulcerative Process and its Treatment. Lond. 1834.

CHAPTER XII.

OF MORTIFICATION.

SECTION I.—OF THE PATHOLOGY OF MORTIFICATION.

DEFINITION.—Mortification signifies the death of any part of the body, in consequence of disease or injury.

VARIETIES.—Some persons use the terms *mortification*, *gangrene*, and *sphacelus*, indiscriminately; but it is better to signify by *sphacelus*, an utter and irrecoverable loss of life, and to restrict the term *gangrene* to the state which precedes, and commonly (but not inevitably) terminates in sphacelus; and in which perhaps the part may still be supposed to be capable of recovery.

Another distinction is made between *humid* and *dry* gangrene. The *humid* is a consequence of inflammation, or of obstacle to the return of the venous blood; and the mortified part, being loaded with fluid effusions, soon undergoes decomposition : whilst the *dry gangrene* is generally a consequence of deficient supply of blood, or of constitutional causes, and is either preceded by no inflammation at all, or by one so rapid that there is no time for interstitial effusions to occur, so that the mortified part becomes dry and hard. In the humid it is called a *slough*, in the dry gangrene an *eschar*.

Another and a most important division is into *constitutional* and *local*. By *constitutional mortification* is meant that which primarily originates in constitutional disorder; or that which, having begun from a local injury, is propagated and maintained by constitutional disorder. By *local mortification* is understood that which has originated in local injury, and by which the system is not implicated, and with which it does not sympathize in a violent or dangerous degree.*

CAUSES.—The *local predisposing causes*, are the same as those of ulceration; namely, congestion, deficient arterial circulation, and structural weakness.

The *constitutional causes* of mortification are,—debility from old age, poverty, starvation, hæmorrhage, scurvy, or long-continued disease of any kind;† disease of the heart with contraction of the aortic orifice, so as to impede the arterial circulation; a peculiar state of the blood causing it to coagulate,‡ and the peculiar state induced by the use of diseased grain, especially by the ergot of rye. These causes are in general *predisposing* merely; but sometimes they are sufficient of themselves to induce mortification, which is then mostly seated in the lower extremities. The gangrene of the feet which was so common amongst such of the soldiers of the wretched Anglo-Spanish expedition as recovered from the Vittoria fever, is a good example of mortification from constitutional causes.

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* Thompson's Lectures on Inflammation ; Guthrie, G. J., F.R.S. A Treatise on Gun-shot Wounds, p. 116, 3rd ed. Lond. 1827.

† Sir B. C. Brodie, in his Lectures on Mortification, Med. Gaz. vol. xxvii., gives the case of a man who caused himself to be largely bled when intoxicated, and the next day one of his feet mortified as high as the instep.

‡ Vide case of spontaneous gangrene, by Dr. Fuller, Med. Gaz., N. S., vol. v. p. 244.

The *exciting causes* may be divided into—*First, mechanical and chemical injuries*, especially gun-shot wounds and compound fractures;—the injection of urine or other stimulant fluids into the cellular tissue;—the application of irritants to constitutions weakened by previous disease, as the application of blisters to children after measles or scarlatina;—long-continued pressure under the same circumstances; hence the sloughing of the skin over the sacrum or trochanters of patients confined to bed with some exhausting disease,—or the application of heat after exposure to cold.

Secondly, an *insufficient supply of arterial blood;* whether from ligature of a main artery,—from thickening of its parietes so as to contract its caliber,—from coagulation of the blood within it, or effusion of fibrine into it, as in arteritis,—or from ossification of the artery, and its conversion into a ligamentous cord, which is the cause of *senile gangrene.* Sloughing of the nose from great loss of blood after a wound in the throat; sloughing of the centre of one of the cerebral hemispheres after a wound of the corresponding common carotid are further instances.* Patches of skin often mortify in œdema and cellulo-cutaneous erysipelas, because its blood-vessels are obstructed by the distention of the subcutaneous tissue with fluid.

Thirdly, *impediments to the return of venous blood*, whether from ligature of a venous trunk,—from coagulation of the blood in it,—from tumours (diseased liver for instance) compressing it, or from disease of the heart.

Fourthly, *injury or division of nerves.*—Thus, the cornea has been known to slough after division of the fifth nerve. Sir B. C. Brodie has seen mortification of the ankle begin within twenty-four hours after an injury to the spine. But, in general, deficient nervous influence operates merely as a predisposing cause. Besides diminishing the vital powers of the part, it takes away that sensibility which is necessary for its protection from injury.

The tissue most disposed to mortification is the cellular; and next to it, tendinous and ligamentous structures, if the cellular tissue surrounding them have been destroyed; then bone, if deprived of its periosteum; next the skin, especially if the subjacent cellular tissues have mortified, or have become infiltrated with fluid; and, lastly, parts of higher organization, as muscles, blood-vessels, and nerves, resist it most.

Like ulceration, mortification may either be preceded by inflammation or not. On the one hand, a part which has been injured may mortify, because it has not strength to support the inflammation which ensues; or, on the other hand, it may mortify slowly, and the mortification may spread slowly, without there being energy enough in the system to set up inflammation, which in its adhesive form is necessary to check the mortification and repair its ravages.

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* Paget's Lectures, Med. Gaz., 1847, vol. iv. p. 1022.

SECTION II.—OF THE VARIETIES, SYMPTOMS, AND TREATMENT.

INFLAMMATORY MORTIFICATION.—*Symptoms.*—When inflammation is about to terminate in mortification, its redness gradually assumes a darker tint, and becomes purple or blue;—the heat, sensibility, and pain diminish; but the swelling often increases in consequence of the continued effusion of sanguinolent (or sometimes of a peculiarly yellow) serum, which not unfrequently exudes through the skin, and elevates the cuticle into blisters. If the *gangrene* proceed to *sphacelus*, the colour becomes dirty brown or black; the parts become soft, flaccid, and cold, and they crepitate when pressed, and emit a cadaverous odour from the gases that are evolved by incipient putrefaction. Whilst gangrene is spreading, the dark colour is diffused, and insensibly lost in the surrounding skin; but when its progress is arrested, a healthy circulation is re-established up to the very margin of the sphacelated portion, and a bright red line of adhesive inflammation (called the *line of demarcation*) separates the living parts from the dead. And the appearance of this line is most important as a means of *prognosis* because it shows that the mischief has ceased, and that there is a disposition to repair its ravages.

Separation of the Mortified Part.—It is at this bright-red line of demarcation that the dead part is separated by ulceration. A narrow white line, consisting of a narrow circular vesicle, and formed by a separation of the cuticle, first appears on it; and when this is broken, a chain of minute ulcers is seen under it. These gradually unite and form a chink, which widens and deepens till the slough is entirely detached;—and then a granulating and suppurating surface remains. In this manner the whole of a mortified limb has been spontaneously amputated;—the bone and tendons separating higher up, and being more slowly detached than the skin, muscles, and blood-vessels. When the adhesive inflammation has duly occurred, this process of separation is unattended with hæmorrhage,—the vessels being obliterated by the effusion of lymph, and coagulation of the blood within them. And this coagulation extends some distance from the mortified part, so that a limb has been amputated in the thigh for mortification of the leg, without the loss of any blood from the femoral artery. Sometimes, however, as in hospital gangrene, these vital processes of adhesion are deficient, and the blood is found fluid in the vessels, so that the separation of the slough is attended with severe hæmorrhage.

Constitutional Symptoms.—The constitutional symptoms of mortification vary with its cause. If it arise, in a healthy subject, from acute inflammation which is still progressing, there will be inflammatory fever ;—but, on the other hand, if the mortification be very extensive —if the inflammation of the adjacent parts be unhealthy, with no disposition to form the line of demarcation, but, on the contrary, with a greater tendency to serous effusion—or if the mortified part be of great importance, as intestine or lung, the constitutional symptoms will be of a low typhoid cast ; there will be great anxiety, hiccough, a jaundiced skin, a soft or rapid, thready, and jerking pulse ; and frequently profuse perspiration of a cadaverous odour.

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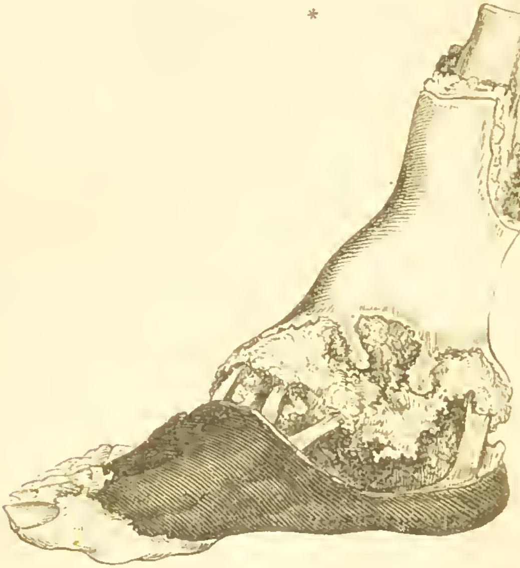

Diagnosis.—It is important not to mistake the lividity and vesications of bruises, especially when they accompany fractures, for gangrene. They may easily be distinguished by their sensibility and temperature ; and by the fact, that in gangrene the whole cuticle has lost its adhesion to the cutis, so that pressure will cause the vesicle to shift its place.

Treatment.—The general indications are, to allay inflammation if excessive ; to support the strength ; and to cause the formation of a line of healthy adhesion, by which the mortification may be arrested.

If gangrene occurs in a healthy, young, robust subject, with great pain, and a full, hard, strong pulse ; and if it appears likely to spread from the violence of inflammation, of which the best example is sloughing of the penis from inflamed chancre, it will be necessary to use bleeding, purging, and the general antiphlogistic treatment; whilst leeches and fomentations may be applied locally. But care must always be taken to reduce the strength as little as possible, whenever a large part is so injured that its death is probable.

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* From a cast in the King's College Museum. The patient was a destitute girl, and the gangrene arose from starvation and exposure to cold.

But an opposite treatment must be pursued if the pulse is quick and feeble, and if there are the other signs of deficient vital power that have been before mentioned. The principal remedies for this state are wine and opium,—whose united effect should be to render the pulse slower and firmer, and to induce a warm, gentle perspiration, and sleep;—whilst it will be a sign that they are injudiciously administered, if they induce or aggravate delirium and restlessness. Sir B. Brodie believes that alcohol is by far the best stimulant, and that it is better to trust to it in urgent cases than to load the stomach with bark. Mr. Vincent agrees with him. Beef-tea, and other fluid nutriment may be given with it. *Opium* is of prodigious utility from its power of allaying irritability; so that it renders the constitution insensible as it were to the local mischief; or, in Hunter's language, "It does good by not letting the disease do harm to the constitution." It may either be given in small doses frequently repeated, or, if there be at any time very great restlessness, especially towards night, it will be better to give a full dose at once; such as forty or fifty minims of the tincture, or two grains of the solid opium. The remedy next in importance is bark, of which the most efficacious preparations are the quinine, liquor cinchonæ flavæ, and decoction of the cinchona lancifolia. It may be given in moderate doses every four or six hours, combined with the acids, or with a small quantity of ammonia; but Sir B. Brodie and Mr. Vincent believe that ammonia, if too long persevered in, depresses the vital energies.—*Vide* F. 1, 2, 3, 4, &c.

Local Measures.—If a part be gangrenous, but not quite dead, its temperature must be maintained by warm poultices and fomentations.

If sphacelus has actually occurred, and the powers of the system are languid, and there is little disposition to form the line of demarcation, or throw off the dead parts, stimulating applications are necessary, especially the nitric acid lotion, F. 119, on lint under the poultice;—the ung. resinæ, thinned with turpentine;—the balsam of Peru;—tincture of myrrh, or of benzoin;—solution of the chlorides properly diluted (F. 127);—or poultices of yeast (F. 155), or of stale beer grounds. Any loose portions of slough may be cut away by scissors, taking care not to tear them away violently.

Incisions are of great service, in spreading inflammatory mortification, attended with extensive effusion of serous or purulent fluids; which not only contaminate the blood, and depress the nervous system by their absorption, but also propagate the disease by diffusing themselves along the cellular tissue, into parts that are still sound.

Question of Amputation.—The rule formerly given on this subject was, that we ought to wait till the gangrene is arrested, and a line of demarcation is formed, otherwise the stump may become gangrenous.

And this rule still holds good in mortifications arising from constitutional causes; in that caused, for instance, by loss of blood, or fever. But even after the line of demarcation has formed, it is necessary to take care that the patient has vigour enough to bear the loss of blood which must in some degree necessarily ensue. Sir A. Cooper mentions a case in which a mortified leg was separating favourably by itself through the calf, when the projecting bones were sawn off, with a view of expediting the process. A few granulations were accidentally wounded, and the trivial hæmorrhage that ensued was fatal.*

But it will be proper to *amputate without waiting for the line of separation*, if the mortification be local as to its cause; as, for instance, in mortification of a limb from severe compound fracture or from injury or aneurism of the large arterial trunks. This practice is sanctioned by Larrey, Guthrie, Brodie, S. Cooper, Lawrence, Velpeau, James, and Porter of Dublin. We may add, that amputation seems to be justifiable as a last resource whenever there appears little or no disposition to limit gangrene, and whenever it spreads rapidly. "Where gangrene," says Mr. Guthrie, "is rapidly extending towards the trunk of the body, without any hope of its cessation, the operation is to be tried; for it has certainly succeeded, where death would in a few hours have ensued." †

MORTIFICATION FROM OBSTACLE TO THE RETURN OF VENOUS BLOOD.—This form of mortification mostly affects the lower extremities of persons who labour under dropsy from diseased heart, and it is always preceded by great œdema. It may occur without inflammation, or may be a consequence of inflammation, which if it attack œdematous parts is always liable to terminate in gangrene. In the former case, the skin of the œdematous limb, having become pale, smooth, glossy, and tense, assumes a mottled aspect of a dull red or purple colour, from distension of the subcutaneous veins. "Then at some part where the congestion is greatest, or where the skin is less yielding, as over the tibia, or above the malleoli, phlyctenæ, or large bullæ, are formed by the effusion of serosity, either alone or mixed with blood, under the cuticle. When these burst, the cutis beneath presents a dark red or brown colour, and very soon is converted into a dirty-yellow or ash-gray slough." ‡ After the spread of the mortification to a given extent, inflammation occurs; and the slough, which is mostly an oval patch of skin and cellular tissue, separates.

Treatment.—The part should be placed in an elevated position, and numerous punctures should be made with a needle, to let the serum exude. The mortified part, and the ulcer that results, are to be treated by warm poultices of yeast, carrots, or stale beer grounds, and stimulating dressings, of which the nitric acid lotion is the best.

MORTIFICATION FROM PRESSURE, BED SORES, &c.— When a patient is confined to bed with some very tedious and debilitating malady, as a fever; and especially if he has not strength to shift his posture occasionally, the skin covering various projecting bony parts (as the sacrum, brim of the ilium, or great trochanter) is apt to inflame and rapidly ulcerate or slough; and more particularly if irritated by neglect of cleanliness, or by the contact of urine. The first thing often complained of by the patient is a sense of pricking, as though there were crumbs or salt in the bed. The part, if examined at first, looks red and rough; then becomes excoriated and ulcerates, or turns black and mortifies. This accident is particularly liable to happen if the spinal cord has been injured.

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* Lectures by Tyrrell, vol. i. p. 237.

† Op. cit. p. 132; Velpeau, Lecture, in Lancet, 1848, vol. ii. p. 32.

‡ Carswell. Illustrations of Elementary Forms of Disease, Lond. 1837.

Treatment.—When long confinement to bed is expected, it is a good plan to apply some stimulant to the skin of the back and hips, to cause it to secrete a thicker cuticle, and enable it to bear pressure better. Nothing can be better for this purpose than brandy; but Brodie recommends a lotion of two grains of corrosive sublimate to an ounce of proof spirit, to be applied twice or thrice a day. If the part seems likely to suffer, it may be covered with a broad piece of calico spread with soap plaster; and small pillows, or mackintosh cushions, or ox-bladders half filled with water, or water-cushions of vulcanized India rubber should be arranged so as to take off the weight from the part affected; and the patient should be made to shift his position often, and occasionally lie on his face; or be placed on a water bed. The soft poultice (F. 153) will be found of great service. After sloughing has commenced, the ung. resinæ is the best application.

SENILE GANGRENE.—*Symptoms.*—This affection commences by a purple or black spot on the inner sides or extremity of one of the smaller toes; from which spot "the cuticle," says Pott, "is always found to be detached, and the skin under it to be of a dark red colour." "In some few instances, there is little or no pain; but in by far the majority, the patients feel great uneasiness through the whole foot or joint of the ankle, particularly in the night, even before these parts show any mark of distemper, or before there is any other than a small discoloured spot at the end of one of the little toes." * Its progress in some cases is slow, in others rapid and horribly painful. After its first appearance, the actual gangrene will generally be preceded by a dark red congestive inflammation. The dead parts become shrunk, dry, and hard; and when the disease makes a temporary pause, which it frequently does, they slowly slough away; but a fresh accession of gangrene mostly supervenes before any progress has been made towards cicatrization. In this way the patient may live several winters, but often sinks exhausted with the nocturnal pain before the whole of the foot is destroyed.

Pathology.—This disease is preceded by ossification of the arteries, or by their degeneration into gristly impervious cords. Hence the foot is imperfectly nourished; it is weak and liable to pain and numbness if heated after being cold; and a chilblain, or any other trivial source of inflammation, is sure to terminate in gangrene. A similar kind of gangrene sometimes attacks the skin of the leg.

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* Pott's Chirurgical Works. 8vo. Lond. 1771.

This affection mostly happens to old persons of the better class, especially if they have been great eaters. They are generally found to have lost their hair and teeth, and their face and hands betray a languid circulation. It mostly attacks men. Mr. James,[*] however, has seen it in a woman of forty-two who had disease of the heart; and Brodie in a man of thirty-six.

Treatment.—It seems agreed now, that this disease should be treated on a cooling, and not on a stimulating plan. The patient should be kept in bed; the bowels should be opened; the diet be restricted to fish, broth, milk, and farinaceous substances, and Dover's powder be given at bedtime, if required, to allay pain. Should the health give way the diet must be made more generous. The foot may be wrapped in lint dipped in lukewarm water, and covered with oiled silk. Brodie recommends a piece of calamine dressing to be laid on the part, and the whole foot and limb to be loosely wrapped in repeated folds of cotton wool, and afterwards sewed up in a silk handkerchief. If there is much discharge this may be changed every second day; if not, it may remain for a week. Amputation is inadmissible.[†]

WHITE GANGRENE OF THE SKIN.—In this curious affection, a circular portion of the skin, generally of the arm, becomes painful, and suddenly mortifies; becoming hard, white, and dry, and showing the red streaks of the vessels with the blood dried up in them. It sometimes spreads by the gangrene of a circle of the surrounding skin. The cause is quite unknown, and the treatment must depend on the circumstances of the case. The possibility that the disease may be caused by the application of some strong acid, for purposes of imposture, should be borne in mind.

CHAPTER XIII.

OF SCROFULA.

SYN.—*Struma, King's Evil.*

DEFINITION.—Scrofula is a state of constitutional debility, with a tendency to indolent inflammatory and ulcerative diseases, and to the deposit of a substance called *tubercle*, in various tissues and organs.

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[*] James on Inflammation, pp. 445 and 552.

[†] Vide Sir B. Brodie's Lectures on Mortification, Med. Gaz. vol. xxvii., and Mayo's Pathology, p. 231; Syme's Contributions to the Pathology and Practice of Surgery, Edin. 1848, p. 5.

General Description.—There are two varieties of scrofulous habits, which, although they agree in the main essential of constitutional debility, are yet totally opposite in many respects. In the *first* (or *sanguine variety*), the skin is remarkably fair and thin, showing the blue veins through it, and presenting the most brilliant contrast of red and white; the eyes are light blue; the hair light or reddish, the forehead ample, and the intellect lively and precocious. Sometimes, however, as Mayo observes, the skin is *dark* and transparent, and the eyes dark, although there is the same general characteristic of delicacy and vivacity.*

In the *second* (or *phlegmatic*) *variety*, the whole aspect is dull and unpromising;—the skin thick and muddy; the hair dark and coarse; the eyes greenish or hazel, with dilated pupils; the belly tumid, and the disposition dull, heavy, and listless to outward appearance; although persons of this conformation will often be found to possess a clear, vigorous intellect, and powers of application far above the average. The great Dr. Johnson is an example.

In both varieties the natural functions are liable to be performed irregularly. Digestion is weak, the tongue often furred, and red on its tip and edges;—the upper lip swelled;—the appetite sometimes deficient, but more usually excessive, and attended with a craving for indigestible substances;—the mucous membrane of the throat and tonsils flabby;—the bowels torpid;—the blood thin and watery—its coagulum soft and small;—the muscles pale and flabby;—and the heart and arteries, as well as the intestines, thin and weak.†

In the sanguine variety, the growth is generally rapid, and the bodily conformation good, as far as outward form is concerned—the limbs well made, the stature tall, and the chest broad. Puberty also is early, and sexual passion is often strongly manifested before the degree of bodily strength permits it to be indulged in with impunity. This is peculiarly the case with the females; who are usually remarkable for that early and evanescent beauty which arises from a development of the adipose tissue. In the phlegmatic variety, on the other hand, the growth is often stunted, the chest narrow, and the limbs deformed with rickets, and puberty retarded, especially in the females, who are liable to prolonged chlorosis. Narrowness of the chest depends on softness of the ribs and their cartilages, through which they yield to the atmospheric pressure, when the diaphragm descends in the act of inspiration.‡

Causes.—Scrofula being thus defined to be a peculiar state of the constitution, it may be shown, *first*, that it may be *congenital* and *hereditary*; that is to say, that scrofulous parents may transmit their peculiar organization, and predisposition to disease, to their children.

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* Philosophy of Living, 2nd edit. 1838, p. 24.

† Mr. Phillips has remarked that the proportion of saline matter in the blood is considerably increased in most cases, and that the albumen also is in excess On Scrofula, Lond. 1846, p. 57.

‡ Vide Dr. Sibson, Med. Gaz., N. S., vol. vi. p. 755.

Not that it follows (as some foolishly quibble), that all the offspring of all scrofulous parents ought necessarily to have scrofulous diseases; nor yet does it follow that the parents must necessarily be scrofulous, although the children be. For parents may beget scrofulous children, if debilitated by privation or disease; if either of them is very old or very young; and probably if either of them labours under a venereal taint, or has been profusely treated with mercury, or has a decided tendency to gout.

Secondly. The scrofulous habit, if not congenital, may probably be created by any circumstance capable, directly or indirectly, of lowering the vital energies; by poverty and wretchedness; meagre, watery, and insufficient food; neglect of exercise; insufficient clothing; habitual exposure to damp and cold, but most especially by want of fresh air and solar light. It is exceedingly common in the insular and variable climate of England, and still more so in Scotland; and it is well known that monkeys and parrots, as well as human beings, brought to this country from the tropics, not unfrequently die of consumption or other scrofulous diseases.

Thirdly. The scrofulous habit may be so intense, that the child is attacked with some of the diseases that we shall presently describe, in spite of all care. Or, on the other hand, actual scrofulous disease may not appear unless the health is first depressed by some other disease, such as scarlatina, measles, the small-pox, or any other acute malady, especially if treated by too much bleeding and mercury. Moreover, everything that disorders the digestive organs may bring it into action. Hence it may be excited in the rich by gross, stimulating, irregular diet, as well as in the poor by habitual scantiness of food. It rarely breaks out before two or after thirty years of age; although it may be called into active operation at any age by circumstances which lower the health.

Pathology of Tubercle.—The most characteristic element of scrofulous disease is the deposit of a peculiar kind of unhealthy lymph, generally found in round masses, whence it derives the name of *tubercle.* Like the unhealthy formations that will be spoken of in the next chapter, it may be deposited in three forms, viz.—1st. In distinct masses, rounded or irregular. 2ndly. It may be infiltrated generally through the tissues of an organ. Or, 3rdly. It may entirely usurp the place and form of some tissue, which is then said to be converted into it. In the first form it is most frequently found in the lungs (where it gives rise to pulmonary consumption), in the follicles of the intestines, in the cancelli of bones, in the brain, in the pleura or peritonæum, and in the cellular tissue. In the second and third forms, it is found in the lymphatic vessels and glands, and in the breast, testis, liver, and kidneys; although it is also frequently deposited in these glands or in their tubes in distinct nodules. But wherever it may be, its course is the same. In its *first stage* it is deposited slowly and insidiously; causing no pain or other symptoms, unless it mechanically interfere with some function. In this quiescent state it may remain for an indefinite period, till at length the *second stage* arrives. Then the surrounding tissues inflame, and form an abscess, which contains the tubercle, softened and broken down by the effusion of serum and pus. After a time, the abscess bursts, allows the tubercle to escape, and then, in favourable cases, may contract and heal. Yet sometimes, instead of giving rise to inflammation and abscess, the tubercle undergoes a natural cure. Its softer particles are absorbed and it is converted into a chalky or earthy substance, which may be quiescent for years.*

With respect to the origin of tubercle, it appears to depend on a defect in the vitality of the fibrine of the blood, which, when effused under certain circumstances, is incapable of developing within itself the germ-cells of healthy tissues, and falls into a state of imperfect organization. It is not necessarily a product of inflammation, although it is often found blended with inflammatory exudation of fibrine, and it is more liable to occur in an organ whose structure and vitality are already impaired by inflammation; but it is generally a mere perversion of nutrition.

There are two states in which it is found: sometimes in minute masses from the size of a pin's head to that of a millet-seed, of a lightish gray colour, and semi-transparent;—sometimes yellow, opake, and cheesy. The former variety is called *miliary;* and is also sometimes called *crude* or *unripe*, on the supposition that it passes gradually into the cheesy form; but it is more probable that the two forms are distinct from the commencement, and that the miliary has a higher degree of organization, and some kind of vitality. The yellow tubercle is sometimes found soft in its centre; but it is doubtful whether this is through a process of degeneration, or whether, in some cases, it is not originally deposited in a fluid state as a kind of pus, and solidified at its circumference by the absorption of its watery constituents.†

Under the microscope the *miliary* tubercle is seen to consist of a mass of granular matter containing nucleated cells, whose envelopes are either wanting, or else blended with the granular matter. The yellow caseous tubercle displays the granular matter with minute

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[*] Vide Latham's Lectures, xii.; Carswell, op. cit., fasciculus *Tubercle.*

[†] Mr. Grant Calder, Med. Gaz. vol. xxii. p. 286, and Dr. Kingston, on the Pathology of Tubercle in the Med. Chir. Trans. vol. xx. The figure above is taken from Mr. Gulliver's appendix to translation of Gerber; see also Grüby, Microscop. Jour. 1842.

spherules and shapeless flakes of fragments, and with a few perfect cells only at its periphery; it contains also numerous oil globules.

Besides tubercular disease, scrofulous patients are liable to a variety of insidious, lingering, and obstinate inflammations and ulcerations. The lymph effused is often frail and curdy;—the pus viscid or serous and flaky; and scrofulous ulcers are weak, with pink surface, flabby, rapidly growing granulations, and loose edges.

GENERAL TREATMENT.—The indications are to strengthen the system and prevent local disease, by rendering the blood pure and the circulation vigorous, and by keeping up the secretions. The means are both *regimenial* and *medicinal*. The former, which are infinitely the more important, are food, air, exercise, and bathing.

(1.) The *diet* of the scrofulous should be nutritious, digestible, and abundant, consisting, as a general rule, of meat, twice a day, good bread, green vegetables, such as peas and the various kinds of cabbage, mealy potatoes, preparations of eggs and milk, and a sufficient quantity of beer or wine to promote digestion, without creating drowsiness or feverishness.

(2.) The *clothing* should be warm, especially for the neck, chest, and feet,—so as to keep up the cutaneous circulation, and prevent congestion in the chest or abdomen. Flannel should be worn next the skin both in winter and summer;—in the former for direct warmth; in the latter to neutralise any accidental changes of temperature.

(3.) Free *exercise* of the muscles and lungs in pure open air is indispensable. The accelerated venous circulation which it causes, and the compression of the abdominal viscera by the contraction of its muscles, are, as Mr. Carmichael has justly shown, the best means of promoting the action of the liver, and of preventing costiveness with its attendant evils. But exercise should be *voluntary*,—because then it will not be likely to be carried to the pitch of *fatigue*, than which nothing can be more injurious. *Gymnastic exercises* should be used with the utmost caution.

(4.) The best *residence* for the scrofulous is one that is warm, without being damp in the winter, and cool and bracing in the summer. The high lands of the interior, Malvern, for instance, or Clifton, in the summer;—" in the late autumn, when the air loses its freshness, and is tainted with the falling leaf and decaying vegetation, the seaside ;" *—in the winter, a town residence; in the spring, the mild climate of the Isle of Wight or coast of Devon, are alternations that are advisable for those that can afford them. But if the habit be extremely delicate, and disposed to phthisis, nothing can be better than a removal to Madeira, or perhaps rather to Egypt, or some tropical country ; provided that it be adopted in time, and that the sufferer be not sent away from home and friends (as is too often the case) merely to die.

(5.) Daily *washing and friction* of the skin are as beneficial to the scrofulous as they are to every one else; and if the patient be precluded from taking exercise, friction is indispensable. Cold *sea-bathing* is in general so advantageous, that it has been deemed a specific. An aperient dose should be given before commencing it, if the habit be gross; and it is a good plan to use a tepid bath or two (90°—80°) first. The object in using the cold bath is to produce a *vigorous reaction;* consequently, before taking it, the nervous and circulating systems should be in some degree of excitement, and the skin should be warm, although not perspiring. At all events the person who bathes should not be exhausted by fatigue, nor in a cooling condition from perspiration. If the bather be strong, he may plunge into the open sea early in the morning on an empty stomach, not only with impunity, but with advantage; but the forenoon is the best time for a weakly child, when the air is become warm, and the system is invigorated with a breakfast. Bathing will be injurious if a short immersion renders the surface cold, numb, and pinched. In many cases, especially of scrofulous ulcers, *river bathing* will be found more efficacious. It may not be amiss to observe, that the washing which is intended to get rid of dirt, is best done with warm water at night; in the morning a hasty sousing with cold water serves to wake the patient up and refresh him.

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* Mayo, Philosophy of Living.

MEDICINAL TREATMENT.—The medicines of use in scrofula are, first, *aperients*, to restore and maintain a proper action of the liver and bowels;—secondly, *antacids;*—and, thirdly, medicines capable of promoting digestion, and rendering the flesh and blood more sound and healthy.

(1.) If at any time the bowels are much confined, or if there is a state of feverishness, or if there is any scrofulous disease going on that is attended with pain and inflammation, it will be advisable to give an active dose of calomel with jalap, or scammony. And the bowels should be kept always regular by some mild aperient, such as rhubarb, magnesia, or castor oil; with a little aloes, blue-pill, or hyd. c. creta occasionally, F. 65, if the stools are not properly tinged with bile.

(2.) *Alkalis* are of great service in scrofula, not only by neutralising acrid secretions in the stomach and bowels, but (as we may suppose) by altering the constitution of the blood. . They are especially indicated if the patient complains of heartburn or great thirst, or if the tongue is very red, or if there is a sinking and craving for food soon after meals. Carmichael* recommends a combination of chalk and sesquicarbonate of soda (gr. x. of the former, gr. v. of the latter) thrice a day after meals: F. 77 will answer the same purpose. The liq. potassæ is more useful for adults. The urine should not be allowed to become alkaline.

(3.) Before reviewing the remedies that come under our third head, we must warn our junior readers not to be too credulous when they hear of a new *specific*. Scrofula is an imperfect condition of bodily health and strength, generally coeval with the earliest period of embryonic existence; therefore it is absurd to suppose that this can be infallibly amended by any remedy whatever. If a medicine improves the appetite, and flesh, and strength, it may be persevered in; but if it causes feverishness, emaciation, or debility, no vague idea of its specific virtues ought to induce the practitioner to continue it.

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* Essay on Scrofula, Lond. 1810.

Bark is of immense service when there is great exhaustion from suppuration, or when ulcers spread rapidly, and when it is necessary to make a sudden impression on the system. The decoction with quinine, or liq. cinchonæ flavæ (F. 1, 4), are the best forms.

Iron is better adapted for permanent administration than bark; especially for thin, pale, flabby children, whose liver and bowels are kept in proper action. The *muriated tincture*, F. 13; the *ammonio-chloride*, F. 14, (whose advantage is, that it can be combined with alkalis, although it is often too stimulating for children); the *sesqui-oxyde;* the old-fashioned *vinum ferri;* the *ammonio-citrate*, F. 12; the sulphate, F. 16, and a combination of the protoxide, with aloes and an alkali, will all be found useful.—F. 20.

Sarsaparilla often produces the most unlooked-for benefit, especially the alkaline infusions, F. 84, 85, or the compound decoction (without mezereon and guaiacum) given in a concentrated form, so that the stomach may not be offended by the bulk of fluid in which it is too much the fashion to prescribe it. This remedy seems to improve the powers of nutrition generally, and may always be given in cachectic diseases for which there is no palpable cause; in fact, when we are at a loss what to prescribe. But it is of most peculiar service when there is great weakness with great irritability; when tonics and nutriment cause feverishness, when the tongue is flabby, coated, and rather sore, and nothing seems to agree.

Iodine should always be administered in combination with a metal, or alkali, or salt that renders it soluble—not in the form of simple tincture dropped into water. It should, moreover, be given in small doses for a long period; half a grain per diem, gradually increased to a grain, is quite enough for an adult. A slight action on the bowels and increase of the urine may be expected; but it should not be permitted to cause emaciation. The iodide of iron (F. 17); the iodide of potassium in doses of not more than gr. iii. *ter die*, with decoction of sarsaparilla; and F. 51; are convenient forms of administration.*

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* We must warn our junior readers against the vague statements they sometimes meet with, to the effect that iodine is good in scrofula *because it promotes absorption*. Scrofula is often said to consist in a peculiarly *lymphatic*, i. e. watery, flabby temperament, which is no doubt partially true. Then again, the *lymphatic* or, as they are sometimes called, *absorbent glands*, are peculiarly liable to become diseased in scrofulous persons. Hence some persons, confounding the *lymphatic temperament* with the *lymphatic* or *absorbent glands*, have asserted iodine to be a good remedy for scrofula, on the ground of its promoting absorption, which is (quite hypothetically) supposed to be the function of the lymphatic glands. But it is *better nutrition*, not more *absorption*, that is wanted in scrofula.

Fish-oil, of which the nicest variety is the *cod's liver oil*, is an admirable remedy for increasing nutrition. It should be given in as large doses as the stomach can bear; beginning with a teaspoonful. Many patients can retain it in their stomachs if they swallow it just before lying down in bed; and lemonade, or ginger wine, are very nice vehicles.[*]

The *sulphates of zinc* (F. 6) *and of copper* in small doses are sometimes serviceable as tonics. The *chlorides of calcium* and *barium* were formerly much praised, but seem to have fallen into merited oblivion. A *decoction* or *extract of walnut leaves* has been used by Dr. Negrier of Angers, both internally and externally. *Common salt*, especially in the form of sea-water, has also been boasted as a specific.

Pain, when violent, must be relieved by opium or other anodynes; and the extracts of conium and aconite in regular doses thrice a day, are often of great service when there are intractable ulcers. The aconite requires caution in its use.

We may add, that F. 65, 20, 87, 43, 12, are combinations of various tonics, aperients, antacids, and alteratives, which will occasionally be found serviceable: that of all medicines, steel is the most important, since it is an ingredient in healthy red blood, and that it ought to be continued daily in small regular doses for two or three years, with occasional intermissions of a week; but that wholesome food, pure air, and warm clothing are more important than any medicines.

PARTICULAR SCROFULOUS DISEASES.

I. Of the Skin.—Scrofulous children are extremely subject to eruptions of small flat pustules about the ears and mouth and other parts, with extensive excoriations of the skin, and exudation of thin acrid matter which dries into scabs. These eruptions are generally contagious.

Treatment.—The general health must be attended to, according to the foregoing rules; and the local disease be treated by the frequent use of soap and water, and the application of the ointments of oxyde of zinc, of white and red precipitates or nitrate of mercury, or of lead. This description and treatment may include almost all the multifarious forms of impetigo and porrigo.

II. Chronic Scrofulous Abscesses (besides those which are caused by diseased glands or bone) may occur under three forms. 1st. They may commence imperceptibly in the cellular tissue. 2ndly. A circular piece of skin, of the size of a shilling or half-crown, with the tissue immediately beneath, may slowly inflame and swell, forming a hard, red, painless tumour like a carbuncle. After a time it suppurates imperfectly, and it does not get well till the whole of the diseased part is destroyed by ulceration. 3rdly. A small hard tumour of unhealthy lymph may form in the cellular tissue, which after a time inflames, causes abscess, and then sloughs out.

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[*] The oil should be pale, and procured from fresh, plump livers at a low heat; the dark-coloured rank oil is not so good. See some observations by Dr. Taufflied, Lond. Med. Gaz., Feb. 28, 1840; and an excellent paper by Mr. Donovan in the Dub. Jour. Med. Sc., Sept. 1845; a letter by the Author in Lond. Med. Gaz., Nov. 9, 1849; and the Pharmaceutical Journal, *passim*.

The *treatment* of the first variety is the same as that of chronic abscess generally. The two others should be left to themselves till they suppurate;—then it may be expedient, if there is a great piece of thin purple skin, to destroy it by potassa fusa; and the case afterwards comes under the head of scrofulous ulcer.

III. Disease of the Lymphatic Glands, especially in the neck, is the commonest of scrofulous maladies. It appears from Mr. Phillips's observations, that the first step is some degree of inflammatory enlargement, which, if it does not subside, is succeeded by a deposit of tubercle. The enlarged glands at first are perfectly indolent and painless. Thus they may remain for years stationary or slowly enlarging, till at length, from local irritation or disorder of the health, they inflame, and chronic abscesses form between them and the skin. In some few cases after the abscess is opened, the cyst contracts and heals, the glands remaining nearly as before. But more generally, all the skin covering the abscess becomes red and thin, and ulcerates; and the ulcer heals with an ugly puckered cicatrix, but not till the whole gland has wasted with suppuration. These swellings have been known to destroy life by compressing the tracheal or cervical vessels, or by bursting into them. Sometimes they undergo a cure by the chalky transformation before spoken of.*

Treatment.—The health must be amended by the measures before detailed;—and an endeavour must be made to cause absorption, by fomentation with hot salt water, or the zinc lotion, or cold poultices made with sea-weed,—by an occasional leech when irritated,—and by painting with tincture of iodine or empl. hydrargyri when indolent. It may sometimes be expedient to extirpate one or more glands. But if suppuration occurs, and *if the skin begins to redden*, an opening should be made in the manner, and with the precautions, laid down in the section on *chronic abscess*.

IV. Tabes Mesenterica, or Marasmus, consists in a tubercular disease of the mesenteric glands, and of the follicles of the intestines, precisely similar in its course and phenomena to the same disease in the cervical glands. The intestines inflame, adhere together, and ulcerate so that openings form between different convolutions; and on examination the peritonæum is found as thick as leather, and the intestines resembling a collection of cells rather than a simple tube.

Symptoms.—Emaciation and voracity, owing to the obstructed course of the chyle; the belly swelled and hard;—the skin dry and harsh;—the eyes red;—the tongue strawberry-coloured;—the breath foul;—the stools clay-coloured and offensive, sometimes costive, sometimes extremely relaxed. The patient of course dies hectic, although he often lasts wonderfully long.

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* Tubercle in the mesenteric and bronchial glands is more frequently found of the grayish translucent variety; and it softens and suppurates less frequently than in the cervical. It has moreover a greater tendency to the chalky transformation.—Vide Phillips, op. cit.

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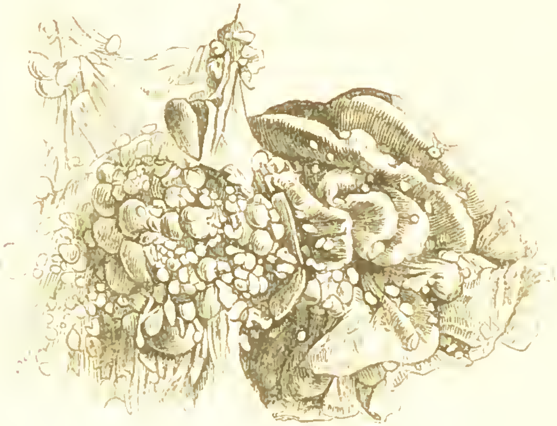

Treatment.—Animal food and other nutriment given in small quantities at short intervals;—mild mercurials to amend the intestinal secretions, especially the combination of hydr. bichlorid. with tinct. cinchonæ, F. 87;—tepid salt bathing;—stimulating liniments to the abdomen;—change of air;—and the cautious administration of the antiscrofulous remedies before mentioned, especially the cod-liver oil.

V. SCROFULOUS ULCERS may be a result of the pustules and excoriations of the skin that have been spoken of,—or they may be formed by the ulceration of chronic abscesses; in which case they sometimes destroy extensive tracts of skin and cellular tissue, and may kill the patient by exhaustion, or render a limb rigid and useless if he recover. Or they may be attended with a hardened base, thick everted edges, a copious formation of pale granulations, and deposit of unhealthy lymph into the adjoining cellular tissue, which, with the granulations, is liable to fits of sloughing, preceded by severe pain.

Treatment.—We have nothing to add to the treatment of the *weak* and *irritable ulcer*, to which classes these must be referred.

Scrofulous diseases of the bones, joints, eye, breast, and testicle; the scrofulous lupus, and ozæna; caries of the vertebræ, and psoas abscess, will be described under the head of the respective tissues or organs which are affected.

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* Represents enlargement of the mesenteric glands from a scrofulous patient.

CHAPTER XIV.

OF MALIGNANT GROWTHS.

SECTION I.—INTRODUCTORY.

Definition.—Malignant growths are diseases of constitutional origin, possessing the following characteristics. (1.) They consist of certain tissues, differing from any that are naturally found in the body. (2.) After a certain period, they have a tendency to disintegration and decay. (3.) They cause the gradual atrophy or transformation of the organs in which they are situated. (4.) Having an inherent power of self-multiplication, they progressively invade and destroy the tissues in their vicinity. (5.) They travel in the course of the lymphatics, and attack the nearest glands. (6.) They generally affect several organs in the same individual; and (7.) If mechanically removed from any part, they mostly reappear in or near the cicatrix.

The *anatomical elements* of malignant growths are three. 1st. Filaments composed of common fibrous or cellular tissue interlaced together, sometimes closely packed, hard, and gristly, sometimes with wide and loose interspaces. 2ndly. Of a liquid blastema, of an albuminous nature (the so called *cancerous juice*) which fills the meshes of the cellular tissue; and 3rdly. of molecules, granules, nuclei, and nucleated cells (the cancer-cells), floating in the cancerous juice, out of which they are formed. The abundance of such cells in the meshes of a cellular tissue appears to be the essential element of malignant growths, although they are as yet hardly to be distinguished from similar bodies, occurring in the normal development of the healthy tissues.*

Pathology.—The development of malignant disease seems to depend on a perversion of nutrition, through which the lymph which exudes through the capillaries, either in the ordinary course of nutrition, or through some accidental inflammation, instead of forming itself into one of the proper tissues of the body, forms an abnormal tissue with the properties of a malignant growth.

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* The formation of nucleated cells was fully described in former editions of this work; but it is now so commonly treated of in every treatise on physiology that it may be omitted here. We have also omitted figures of cancer cells and cancerous tissue, because surgeons are not agreed as to the extent to which the microscope is available in the diagnosis of cancer, and because it would be impossible to do justice to the subject in so small a work as the present.—Vide Carswell's Pathology; Müller on Cancer and Morbid Growths, translated by C. West, M.D., Lond. 1840; Dr. Walshe's article on Cancer in the Cyclopædia of Practical Surgery, and his larger work on Cancer, Lond. 1846; also on Adventitious Formations in Todd's Cyclopædia, parts 30 and 31, and Hughes Bennett, on Cancerous and Cancroid Growths.

CAUSES.—The cause of this perversion is some ill-understood constitutional diathesis, which is very frequently congenital, and inherited, but sometimes appears to arise from various causes that impair the vital energy; of which, mental anxiety and depression are the best established.

Local Origin.—When this diathesis is strong, malignant disease may break out spontaneously in one or more tissues or organs;—when not so strong, its development may be aided by local irritation, or injury.

Contagiousness.—The older writers believed that the *discharge* from cancerous ulcers was contagious. All attempts, however, to propagate the disease by inoculation have failed of late years, and therefore the modern opinion is the reverse.

Mode of Deposit.—Malignant growths may be deposited in two forms; viz. either in one or more *distinct tuberous masses;* or else the morbid growth may be *infiltrated through the tissues* of an organ; the proper *substance* of the organ being gradually replaced by the morbid growth, although the *form* may for a time be little altered.

Growth.—When malignant growths are once formed, they increase in size by the perpetual development of new cells; and these progressively infiltrate the parts adjoining. They are supplied with fresh material by blood-vessels, which permeate their interstices in more or less abundance.

Destruction.—After a certain time the older portions of a malignant growth lose their vitality and soften down, and the skin or mucous membrane covering them ulcerates to allow of their discharge.

Atrophy.—It appears certain, however, that malignant growths may, in rare cases, undergo a process of atrophy, and not proceed to these destructive changes. (1.) The cancer-cells may cease to propagate; and the growth shrink, and leave a puckered fibrous cicatrix. (2.) The cancer-cells may undergo a fatty degeneration. This not unfrequently occurs in *portions* of an old scirrhous growth, producing sometimes distinct yellow masses, composed of disintegrated cancer-cells and fat, sometimes a yellow reticulum, which was described by Müller as one variety of cancer. This form of atrophy seldom affects an entire cancerous growth; so that some parts spread though others have decayed. (3.) Malignant growths, like tubercle, may become atrophied and leave nothing but their mineral constituents in the form of a putty-like or chalky mass, with the skin puckered over it.

VARIETIES.—There are three varieties of malignant disease, viz. scirrhus; medullary sarcoma; and colloid. That they are very nearly allied to each other is shown by the circumstance that two or more of them may affect different organs in the same individual; or may even exist together in one tumour; and that if one variety be extirpated, another may make its appearance in the cicatrix. But it does not seem probable that they are *identical*, or that one can be transformed into another by any process of development. If of the three constituents of malignant growths, the fibrous element predominates, the result is scirrhus ; if the cells, medullary sarcoma ; if the fluid abound and be collected into loculi or little cysts, colloid. Melanosis, though not strictly a malignant growth, may be conveniently treated of in this chapter, because it often accompanies them.

Cancroid and Semi-malignant Growths.—The name *cancroid* is given by Hughes Bennett to growths which resemble malignant growths in most of their coarser physical properties, so that they must necessarily be confounded with them, unless the microscope be employed, which reveals a difference of internal structure. The name semi-malignant is given to some diseases which differ from the malignant in the circumstance that the morbid changes are purely local ; and that, although incurable or destructive to life if left to themselves, they do not attack several organs at a time, and if removed thoroughly do not return.

The growths most resembling cancer are, 1st, the common fibrous tumor, which may be said to be cancer, *minus* its cells. This, both in the form of the indurated rings surrounding mucous canals in stricture, and in the form of sarcomatous, neuromatous, and desmoid tumours is often confounded with scirrhus. 2ndly. Cartilaginous growths, or enchondroma. 3rdly. Growths whose essential constituent is a morbid production of epithelium ; as the warty and fungous excrescences on the skin and mucous membrane, known by the name of chimney-sweeper's cancer, warty cancer of the lip, cauliflower excrescence of the womb, &c., and certain ulcers on the tongue and lip. These are the growths particularly distinguished as semi-malignant. Besides these, wens, fatty tumours, and tubercular glands may in certain cases be confounded with true malignant growths.*

SECTION II.—OF SCIRRHUS.

SYMPTOMS.—Scirrhus begins usually as a rounded and peculiarly hard tumour, subject to occasional fits of severe lancinating pain.

ANATOMICAL CHARACTERS.—Scirrhus is hard, heavy, and almost cartilaginous in consistence. In bulk it is rarely larger than an orange. It cuts crisply, with a creaking sound like a potato or unripe pear. The cut surface has a peculiar semitransparent glossiness, and its colour varies from a bluish-white if the mass is in a firm condition, to a pale dirty fawn or grayish tint, if softer. It is unctuous to the touch. Pressure causes the exudation of the *cancerous juice*, clear and transparent if the tumour be firm, thicker and creamy if of longer growth. If it have begun to soften in spots, from these pressure may cause an opake pultaceous matter to exude, just as the matter does from a sebaceous follicle.

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* There are many points in the natural history of cancerous growths which still are involved in obscurity. There are many tumours of which it may be said that they are truly cancerous from the first, and whose nature, structure, and destiny can be predicted with certainty. Others there are of which it can with equal certainty be affirmed, that they are not cancerous, and never will be. But there is an intermediate class, of which it cannot be predicated with certainty, whether they now contain cancerous structure, or if not now, whether after a lapse of years they may not acquire cancerous structure and go through the destructive changes of that disease. Again, with regard to the epithelial growths, which Hughes Bennett separates from cancer, he is obliged to confess that the lymphatic glands in the vicinity "are subject to the same epithelial form of growth as affects the tongue, face, or other similar structures." In other words, that instead of being strictly *local* they *may* contaminate the adjoining lymphatic glands.

Scirrhus is sparingly and irregularly supplied with blood-vessels. It is common to say that it contains numerous white bands intersecting each other;—but these are only found in the female breast, and consist of the lactiferous tubes.

In the progress of *decay*, it softens into a dirty buff-coloured pulp; and becomes infiltrated with a creamy liquid.

PROGRESS AND TERMINATION.—The progress of this disease is twofold. On the one hand, it spreads and successively invades all the adjoining tissues;—and at the same time the older portions of the morbid growth perish by ulceration or sloughing. At first the tumour is indolent and painless, so that the patient may be for a long time ignorant of its existence; it is also circumscribed and freely moveable. After a time it is affected with fits of severe lancinating pain, which gradually increase in frequency and severity. Then it slowly enlarges;—loses its distinctness, becomes blended with the adjacent parts, and adheres to the skin and to the parts beneath it. At last the *destructive stage* commences. Portions of the tumour soften down, and form irregular abscesses; the skin ulcerates or sloughs,—and thus an *open cancer* is formed. This ulcer enlarges in every direction; its edges are thick and jagged;—sometimes undermined and inverted; sometimes swelled and everted. The surface is tawny or ash-coloured, and eaten into irregular hollows. The discharge is thin, sanious, fetid, and irritating,—and there is an almost constant burning pain. Sometimes a feeble attempt is made towards reparation;—pale, flabby granulations are thrown out, and a portion of the sore cicatrizes for a time. In some few cases, the whole of the diseased growth has sloughed out, and a permanent cure has followed.* But in general the ulceration spreads, the neighbouring glands or

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* Travers on Malignant Diseases, Med. Chir. Trans. vol. xv. p. 213.

viscera become contaminated, and the patient sinks from the constant pain and irritation.

Constitutional Symptoms.—From the first there is a state of ill health which cannot be solely attributed to the local disease, and which is denominated the *cancerous cachexia.* The patient is languid, depressed, and emaciated;—the complexion is leaden and sallow, the appetite bad, and digestion imperfect. As the disease advances, hectic is induced by the pain and exhaustion, and the patient suffers perhaps from the co-existence of the disease in other organs. An extraordinary *fragility of the bones*, so that the femur might be broken by turning in bed, is by no means an uncommon phenomenon;—partly arising from atrophy, partly from scirrhous disease developed in them.*

Diagnosis.—The principal characteristics of scirrhus are, *hardness*, *lancinating pain*, the co-existence of the *cancerous cachexia*, and the patient's *age.* It has been proposed to puncture a doubtful tumour with an exploring needle so constructed as to bring away a small portion of the tissue, which may be examined with the microscope, to see whether it contains the cancer cells or not. If there is an open sore, a small portion can readily be removed for examination.

Prognosis.—Although the destiny of a scirrhous tumour and of the patient are pretty certain, still the time in which the disease may prove destructive is most uncertain. So that if the patient is old—if the disease has lasted long, and has been slow in its progress—if the health is tolerable, and the cachexia not well marked—much comfort may be derived from the assurance, that, although the disease may be incurable, yet that life may be prolonged for many years, and the tumour possibly become quiescent, or undergo atrophy.

Duration.—Scirrhus is slower in its progress than any other variety of malignant disease; for although it has been known to prove fatal in two months, yet it may creep on for more than half a century. But in most cases from three to four years may be safely assumed as the period within which it destroys life.

Causes.—Scirrhus *may* occur at any age, but it is very rare indeed under thirty; yet it has attacked girls under twenty. It most commonly attacks the uterus, female breast, stomach, and skin. Women are more liable to it than males in the ratio of nearly three to one; and the greatest mortality amongst them occurs between the ages of thirty-five and fifty; at the time when the generative function ceases, and the constitution undergoes its most critical change. Whether it is more likely to attack the married or the spinster, the barren or the fruitful, those who have suckled or those who have not, are points yet undetermined. The complexion most commonly attacked is the dark bilious. Blows or other injuries may act as *exciting causes*, and produce it in a particular part;—but they cannot do so unless the constitutional tendency exists.

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* Salter in Med. Chir. Trans., vol. xv.

TREATMENT.—The first thing generally spoken of under this head is *extirpation by the knife*, which is considered by some surgeons as the only remedy worth mentioning. Others condemn the knife, either as useless, or as mischievous. Thus Mr. Vincent says, that "The removal of unequivocal cancerous disease does not prolong life,"* and Dr. Walshe, that "excision cannot be undertaken without imminent risk of putting the patient in a worse state than he or she was in before the use of the knife."

The author will endeavour, therefore, to state what is to be said on either side, and to see at what middle point the truth lies.

In the first place, *against* the practice of excision must be alleged the fact that malignant diseases are constitutional and not local; that the removal of one affected part cannot remove the diathesis, and that the disease is almost sure to return in the original situation, or in some other; witness the common results of the extirpation of a cancerous mamma. That in some instances outward cancer is accompanied by the disease inwardly, and that to remove the former would be taking away only part of the disease already existing: for instance, in malignant disease of the eye, or of the testis, some part within the head or abdomen is commonly affected likewise, and operations in such cases are most rarely successful. That the removal of outward cancer, like the pruning of a tree, sometimes seems to rouse the activity of the diathesis, and give increased energy to the morbid growth, if produced afterwards. That the entire removal of all affected particles of tissue is often unattainable. That some patients are killed by the operation itself; and that some have died from being operated on for what afterwards proved to be no cancer at all.

On the other hand, *in favour of operating*, it must be said that instances are known in which there has been no return of disease after excision. That other instances are known in which life has undoubtedly been prolonged by the removal of an actively progressing cancer. And that even if the disease does return, the operation, thanks to chloroform, may be painless, and the interval one of health and comfort.

It may be concluded, then, that an operation may be proposed to the patient (who should of course be informed of the precarious chance it affords), if the disease is moveable and circumscribed, so that it can all be cleared away with the knife.

If, however, the skin is extensively tuberculated and adherent to the scirrhus—if the surrounding fat and cellular tissue are implicated—if the tumour is firmly adherent to the parts beneath—if it is extensively ulcerated—or if the original disease is much less in degree than co-existent scirrhus of the adjoining lymphatic glands—or if the patient's health is fast sinking—or if there is any palpable internal disease—the operation should not be attempted. Yet, even then it may be justifiable occasionally, in order to remove tumours obstructing the natural outlets of the body, or to get rid of a bleeding, offensive mass, and so relieve the patient temporarily from pain.

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* Vincent, op. cit. p. 353.

Extirpation, if determined on, may be effected (1) by the *knife;* and in so doing care ought to be taken to remove every particle that appears unsound; (2) by *caustic*, which may be resorted to in flat cancerous affections of the skin;* (3) by *ligature*.

It must be added that, in the judgment of competent authorities, an operation is more likely to be successful *after* a course of proper treatment, than if performed at the earliest period; and that a course of alterative remedies is advisable *after* the operation, in order to diminish the chances of a return.

Besides operative measures, the treatment may consist in attempts, 1st, by internal and external remedies to procure the absorption of the tumour; or, 2ndly, if it is in the ulcerated state, to alleviate the patient's sufferings.

Internal Remedies.—The preparations of *iron* may be given with benefit when the lips are pale, the pulse weak, and the patient low and emaciated. The *ammonio-chloride* in pills, in doses of gr. ii. *ter die*, was a favourite medicine of the late Mr. Cline, and often effected the dispersion of chronic indolent tumours. *Mercury.*—Sir A. Cooper recommended five grains of Plummer's pill at bedtime, and a draught of carbonate of ammonia with a vegetable bitter, twice in the day, F. 189. Mercury is also often highly useful in small nightly doses, with narcotics F. 63; but given in large quantities certainly hastens the progress of the disease. *Narcotics*, especially *conium*, have been boasted as specifics; but their utility is doubtful, except as adjuvants to tonics, and to allay the agony of open cancer. *Iodine*, in various forms (F. 88, &c.), and *arsenic*, being most powerful tonics and alteratives, deserve a fair and protracted trial; and especially the *iodide of arsenic*, in doses of gr. $\frac{1}{16}$ *bis die* in a pill, with ext. conii, to be taken two hours after meals. F. 9, 14, 15, &c., may be of service in some cases. *Change of air* (especially to countries comparatively exempt from cancer, such as Algiers and Egypt), freedom from anxiety, a diet that will support the strength without heating the system, wine in moderation, if the patient is weak and accustomed to it, are other measures that we need not do more than allude to. *Vegetable diet*, or low diet, approaching starvation, has been recommended. But by weakening the system, and increasing the irritability of the heart and nervous system, it cannot fail to be mischievous.

Local Remedies.—*Leeches.*—If the patient is young and plethoric, —and the fits of pain are frequent, and accompanied with heat and throbbing, the diet should be reduced, the bowels be freely opened, and leeches be applied. In fact, occasional leeching is almost always of service in the *early* stages of any form of malignant disease. *Iodine* paint, or the ointment of iodide of lead, F. 89, which is much less irritating than the common ointment, may be smeared on the tumour when indolent. Sometimes iodine, calomel, and other remedies may be applied in *sachets;* that is to say, in little muslin bags, filled with cotton wool powdered with the remedy in question, and covered with oiled silk on the side that is *not* applied to the skin.

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* Vide *Lupus*, in Part IV. Chap. ii.

Pressure.—This was tried some years ago with partial success, and has been revived by Dr. Walshe, who entertains rather sanguine expectations of its good results. The manner in which it may be most conveniently applied is by an instrument that has been invented by Dr. Arnott. It consists of a spring passing either round the body or over one shoulder by means of which the pressure is generated;—of bands, pads, &c., for maintaining the apparatus comfortably *in situ;*—of a shield or circular frame;—and of a cushion within the shield, partially filled with air. The diseased part is received into this *slack air cushion* which adapts itself admirably to its surface. The pressure should be steadily applied, and gradually increased from about two pounds to six or more. This plan of treatment certainly deserves a fair trial, since, according to Dr. Walshe, if it has no other effect, it certainly procures an extraordinary alleviation of pain.

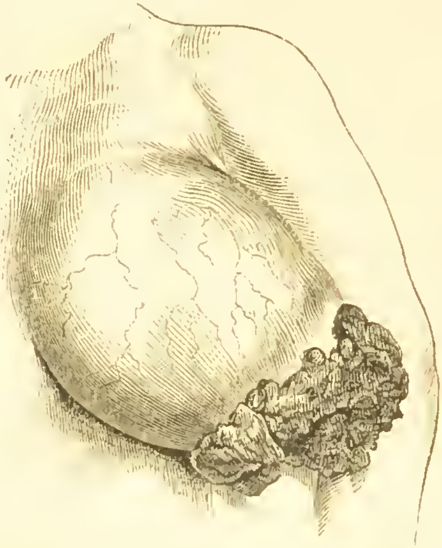
Palliative Measures.—In order to allay pain, and lessen the fœtor and acrimony of the discharge, use may be made of many of the applications recommended for *irritable ulcers*, especially the black wash, the solution of nitrate of silver, and the opiate lotion. Fermenting poultices, iced water, and bismuth ointment ; in fact, any succession of mild stimulants and sedatives may afford some temporary relief. Nothing should be applied that is very warm. Dr. Fagan informs the author that he has found a solution of tannin produce cicatrization, and otherwise give great relief in a case where the skin was infiltrated with scirrhus and on the point of commencing ulceration, as it often does, by a wide excoriation.

SECTION III.—OF MEDULLARY SARCOMA.

SYN.—*Encephaloid disease; carcinoma medullare; soft cancer; fungus hæmatodes; spongy inflammation.*

SYMPTOMS.—Medullary sarcoma usually commences as a soft, rounded, elastic tumour, growing rapidly, generally free from pain or tenderness, and not circumscribed or moveable, but blended with the surrounding tissues.

ANATOMICAL CHARACTERS.—On a section this tumour appears to be composed of a white opake substance of the colour and consistence of brain, streaked with numerous minute blood-vessels. It very often happens that its delicate blood-vessels are ruptured, and the tumour, becoming infiltrated with blood, resembles a coagulum: in this state it is called *fungus hæmatodes.* Sometimes after rupture of a vessel the effused blood is absorbed, as after apoplexy of the brain, and there is left in its place a cyst containing a clear or coffee-coloured serum. Some portions of the mass are sometimes harder than brain, whilst other parts have softened into an almost diffluent pulp.



Progress and Termination.—This tumour enlarges rapidly; and its arterial circulation is sometimes so vigorous as to cause pulsation like an aneurism. The skin covering it soon becomes purple or livid; and the subcutaneous veins enlarged and tortuous. It is now subject to fits of aching or throbbing pain, but by no means so severe as that of schirrhus. At length one of the most projecting points ulcerates, and discharges a grumous fluid, — and a rapidly increasing fungus grows from the aperture. Sometimes this fungus exudes an enormous quantity of a thin, colourless serum — sometimes it is covered with a slight crust of coagulum — sometimes its blood-vessels give way, and there is a profuse hæmorrhage — and sometimes large portions of it soften down or slough. The constitution suffers in the same manner as in scirrhus, but much more early and severely; and the patient expires after a few months, worn out by the irritation of the external malady, and by its invasion of the viscera.

This form of malignant disease has a special preference for the testicle, lungs, kidneys, spleen, and meninges, and is the form which generally occurs in the earlier periods of life; moreover, it generally takes the place of scirrhus, when the latter has been removed by excision. It occurs more generally in a distinct or *tuberiform* mass, than in the form of infiltration.

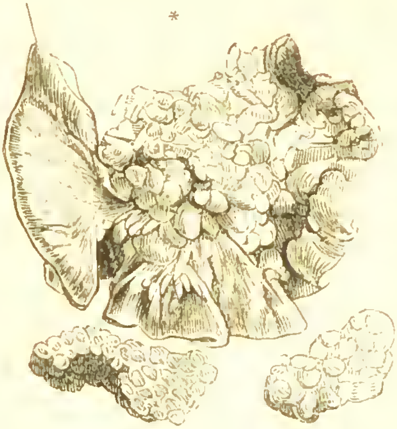
Varieties. — The *mammary sarcoma* of Abernethy, the *milklike* tumour of Monro the youngest; and the *solanoid* and *nephroid* tumours are varieties of this disease, deriving their appellations from their accidental resemblance to the organs or substances after which they are named. The *disseminated globose sarcoma*, which has been recently described, consists of tuberous masses of this disease deposited in the subcutaneous cellular tissue.

DIAGNOSIS.—This disease is to be distinguished from scirrhus by the absence of hardness and lancinating pain;—by the greater rapidity of its growth;—by the larger size it attains, tumours the size of a man's head being not uncommon;—by the earlier and more decided cachexia;—by its attacking persons of every age, and being more frequent in the young, whereas scirrhus is exceedingly rare under thirty;—and by its disposition to fungate rather than to ulcerate.

PROGNOSIS.—This of course will be highly unfavourable, the patient sinking much sooner than in scirrhus.

TREATMENT.—The constitutional treatment is the same as directed for scirrhus. *Leeches* frequently applied at the earliest appearance of the disease will sometimes retard its progress. *Cold* or *iced* applications, and the ligature of the principal arteries supplying the tumour, have been recommended for the same purpose, but are not worth trying. *Extirpation* is hardly to be thought of, because the disease is sure to return, perhaps before the wound has healed. *Hæmorrhage* in this disease, or in cancer, may be restrained by pressure with a piece of lint.

SECTION IV.—OF GELATINIFORM CANCER.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GELATINIFORM CANCER.—(SYN. *Tumeur Colloid, Carcinoma alveolare.*) — This remarkable growth is seen, on a section, to be composed of innumerable white interlacing fibres, forming distinct *loculi* or partitions of a tolerably regular spherical shape. These *loculi* vary from the size of a grain of sand to that of a pea, and are filled with a soft, viscous jelly, of greenish yellow colour, which generally is clear and transparent, but occasionally turbid and opake. The jelly-like matter is composed entirely of albumen, and retains its transparency in alcohol. This form of malignant growth generally infests the stomach and omentum, as exhibited in the preceding drawing from a preparation in the King's

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* Of the two smaller figures, one exhibits the circular loculi as they appear on a section; the other shows the compound spherical character of the malignant growth itself.

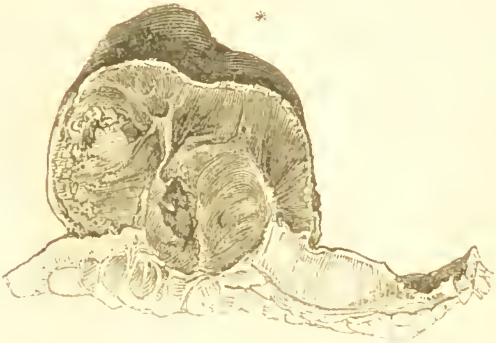
College Museum. Sometimes portions of it are developed in a scirrhous tumour, and have been mistaken for a softened state of the latter. It is much rarer than either scirrhus or encephaloid, and as yet has only been observed in adults.

SECTION V.—OF MELANOSIS.

General Description.—Melanosis is a disease consisting in the deposit of a brown or black pigment like that of the choroid coat of the eye. The black substance is bleached by nitric acid and chlorine; and is not carbon like the black matter in the lungs of old persons, nor yet sulphuret of iron. It may either be deposited in a tuberiform mass, or may be infiltrated through the substance of an organ. The most common primary seats of the affection are the subcutaneous cellular tissue and the eye, but when once the diathesis is established, the liver, lungs, bone, and many other internal organs may be invaded. Horses, especially grays, are more liable to melanosis than man is.

Melanosis is not considered by pathologists a really malignant growth, because, though it depends on a certain diathesis,—is incurable,—returns if excised,—affects many organs in the same individual, and produces a cachexia,—yet it does not form a *tissue*, but the cells continue free like those of pus or tubercle. Yet it is convenient to consider it in this chapter, because it is not uncommonly found associated with scirrhus or encephaloid.

Progress and Termination.—The average duration of life in individuals affected with this disease, is probably under two years. The tumours after a time increase, soften, irritate the neighbouring tissues, and ulcerate; and the irritation of this process, coupled with the peculiar cachexia of the disease, and the disturbance which its presence in various internal organs causes to their functions, are very sufficient causes of exhaustion and death.



Treatment.—External tumours may be extirpated, if the surgeon thinks it advisable, and the health is pretty good. The general health should be carefully attended to.†

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* The above cut shows a tuberiform deposit of melanosis in the cutis vera.

† Carswell, op. cit. Fawdington on Melanosis, Lond. 1826; Mackenzie on the Eye, p. 553; Holmes Coote in Lancet, Aug. 8, 1846.

PART III.

OF THE DIFFERENT KINDS OF INJURIES.

CHAPTER I.

OF INCISED WOUNDS.

Definition.—Wounds made with clean-cutting instruments.

Treatment.—There are four indications:—1, To arrest hæmorrhage; 2, to remove foreign bodies; 3, to bring the divided parts into apposition, and keep them in union; 4, to promote adhesion.

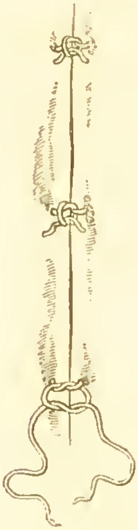
(1) To *arrest hæmorrhage*, moderate pressure, a raised position, and the application of cold, will be sufficient in most cases;—but if an artery have been wounded, or the bleeding prove obstinate, the measures must be adopted which will be indicated in the Chapter on Wounds of Arteries.

(2) The *removal of foreign bodies* if any are in the wound should be effected as soon as possible. The best instruments for this and every other surgical purpose which they can perform, are the fingers:—but they may be aided by probes and forceps, if necessary. Dirt, gravel, &c., are best got rid of by affusion with water. All clots of blood must likewise be removed, or they will act as foreign bodies and prevent adhesion.

(3) In order to *bring the sides of the wound into apposition*, the part must be placed in such a position as will relax any muscular fibres that have been divided, or that may be subjacent to the divided parts. Then the edges must be made to meet as nicely as they can without undue straining, and must be retained by cross strips of adhesive or isinglass plaster, one end of the plaster being first applied to that side of the wound which is loosest, and the other being brought across with a mild degree of traction. Then a light compress and bandage may be applied to keep on the dressings, and protect the parts from injury. If the wound is so situated that the plasters cannot be applied smoothly, a slip of lint may be laid on it first.

Collodion.—A very useful substitute for adhesive plasters in many cases is the solution of gun cotton in ether, commonly known by the name *collodion.* This when applied to any surface dries instantly, forming a semi-transparent film of considerable tenacity, adhering firmly, and forming an artificial scab under which wounds often heal without any suppuration. In applying it, the edges of the wound should be held together as exactly as possible by an assistant, whilst a thick layer of the collodion is smeared across with a brush or small spatula. This substance contracts so strongly that it should be put on in *one layer*, once for all; not in repeated layers, else those which are put on afterwards will drag off those applied first.

Sutures.—In some cases it is requisite to have recourse to sutures, in order to get a better purchase upon the edges of the wound, and hold them securely in contact. They should be used in wounds of parts that are naturally loose and moveable, or that have no firm part underneath against which they can be fixed. Thus the interrupted suture is used in wounds of the eyelids, scrotum, and female perinæum, and when a portion of the nose or ear has been detached; and the twisted suture in wounds of the lips; in the cases in fact in which adhesive plaster would be insufficient. But adhesive strips should always be placed in the intervals of the stitches, to prevent any strain upon them. They may be removed in from three to four days;—sooner if violent irritation comes on;—but not so soon if there is no great action. The surgeon must never employ them in order forcibly to drag the lips of a gaping wound into contact, or they will give great pain, and his intentions will be frustrated by their speedily ulcerating. *Five species* are enumerated in the older authors.



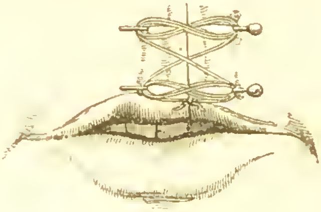
1. The *Interrupted Suture* is thus made. A needle armed with a single ligature is passed through one lip of the wound *from without*, inwards;—then at a corresponding part through the other lip *from within*, outwards. Then the ends of the ligature (which may be made of silk, or stout hempen thread, well waxed and flattened, that it may lie easily in the wound) are to be drawn together, without, however, any great straining, and are to be tied tightly in a double reef knot, as represented in the adjoining figure.

The needle should be carried deeply enough to obtain a firm hold, but should not include any tendinous part. As many of these stitches are to be made as are necessary; half or three quarters of an inch is a proper interval.

2. The *Twisted Suture* is made thus. The edges of the wound having been placed accurately in contact, a sufficient number of pins are to be passed through both of them at convenient distances. The first pin should be placed at any loose angle which there may happen

to be. When all the pins have been introduced, and the parts are accurately adjusted, the middle of a long piece of silk is to be twisted around the uppermost, in the form of a figure of 8. Then the two ends are to be brought down and twisted round each of the other pins successively in like manner—and, lastly, are to be secured by a knot.

The pins were formerly made of silver, with steel points, that were removed after they were inserted; but the fine pins used by entomologists for fixing insects, or fine steel needles with lancet points, are excellent substitutes. They are so small that they excite little irritation; and a great number of them may be employed, so as to insure as nice an adaptation as possible. But after they are inserted, their points must either be cut off, or else be guarded with a lump of wax, in order that they may do no mischief.



3. The *Glover's* or *Continuous Suture* is nothing more than the ordinary way of sewing things together practised by seamstresses and housewives. It is employed in wounds of the intestines and abdominal parietes.

4. The *Quilled Suture* is performed by passing a sufficient number of ligatures, as in the interrupted suture. But instead of being tied to their opposite neighbours, all the threads on each side of the wound are fastened to a quill, or bougie, or roll of plaster. This suture is now nearly or quite obsolete; it was formerly supposed to be very advantageous in pressing the deep parts of a wound together.

5. The *Dry Suture* was made by sticking a strip of adhesive plaster, or (before that was invented) a strip of linen, smeared with white of egg and flour, to the skin on each side of the wound. The adjacent margins of the plaster or linen were then sewed together.

(4) The fourth indication is *to keep down inflammation;* that is, to prevent it from surpassing the degree necessary for adhesion. This is to be effected by opening the bowels, lowering the diet, enjoining rest, avoiding tight bandages and every other source of irritation and constriction, and maintaining the injured part in as comfortable a state of feeling as possible; which, as was before observed, is the surest means of preventing inflammation. If, however, much pain and swelling supervene, the water dressing, or a poultice, must be resorted to, and plasters, bandages, and sutures be abandoned till granulation commences. Then the parts may be again gently approximated, that they may heal by the *second intention;* that is, by the inosculation of their granulations.

CASES OF COMPLETE DISUNION.—If any small portion of the body (a finger or part of the nose for instance) has been completely cut off, and if it be reapplied as soon as possible, and retained by plasters or sutures, and wrapped up so as to preserve its temperature, it will very probably unite again. And even if such a part have been separated for a considerable time, the attempt should not be given up;—but it should be well washed in warm water to free it from dirt, and the stump should also be bathed, so as to remove any dry coagulated blood, before they are reapplied to each other. Part of the left forefinger, an inch and a half long, having been cut off for twenty minutes, was replaced and united perfectly in four days. The case is related by Dr. Balfour of Edinburgh, and is quoted in Sir A. Cooper's lectures.

CURE OF OPEN WOUNDS.—If a part has been abstracted which cannot be restored;—or if any kind of wound cannot be covered by skin, the first plan on which it may be treated, is by endeavouring to form a *scab;* by covering the wound with pledgets of soft lint soaked in blood, which are to be allowed to dry and adhere. This is the natural and simple way in which most slight accidents heal when not interfered with by art, and Mr. Wardrop has seen the large surface exposed by the removal of a diseased breast heal completely under a crust of blood in thirty days. The old-fashioned remedy, the *Friar's Balsam*, or *Tinct. Benzoes comp.*, is an excellent application for wounds attended with some degree of contusion.

If there is no pain, or bad smell, the wound should be allowed to remain unopened till the scabs drop off, and show a cicatrix underneath. But if it becomes painful, and a fetid matter oozes out, warm poultices or water dressing should be applied, and the wound be treated like a common granulating sore.

Or, instead of attempting to form a scab, the surgeon may apply water dressing, or poultices from the first, when, if the case proceeds favourably, the wound will become filled with a pink lymph, which forms a pliant cicatrix, without granulation, and without suppuration.

CHAPTER II.

OF PUNCTURED WOUNDS.

GENERAL DESCRIPTION.—These are justly esteemed the most dangerous of all wounds. (1.) Because from their depth they are liable to implicate blood-vessels, nerves, viscera, and other deep-seated parts of importance. (2.) Because the parts which they traverse are stretched and torn, and consequently are disposed to inflame and suppurate. (3.) Because matter when formed has no free exit, and is liable to burrow extensively. (4.) Because foreign bodies may be carried into great depths without being suspected, and create long-continued irritation. (5.) Because they are most liable to be followed by tetanus.

TREATMENT.—The first point usually mooted in discussing the treatment of these wounds is the propriety of dilating them, and converting them into simple incisions, in order to avert the deep-seated suppuration and confinement of matter. But as those evils are incident on the inflammation that supervenes, and as they by no means follow of necessity, an endeavour should be made to prevent or mitigate inflammation, so that there may be no necessity for such a severe measure.

In the first place, therefore, rest, low diet, purgatives, cold lotions, and leeches, must be employed, to counteract all excess of inflammation and to cause the absorption of any blood that may be effused in the course of the wound. But if, notwithstanding, there should be severe pain, and swelling, and fever, a free incision must be made for the relief of tension and the discharge of matter;—and the case must be treated in the same manner as a deep-seated abscess.*

CHAPTER III.

OF LACERATIONS AND CONTUSIONS.

SECTION I.—OF CONTUSION AND ECCHYMOSIS.

DEFINITION.—A contusion signifies an injury inflicted by some obtuse, blunt object, without perforation of the skin.

CONSEQUENCES.—The consequences of contusion are, (1) a degree of *concussion*, or benumbing, which may be pretty severe, without much further mischief; (2) some *structural injury*, which will be followed by inflammation. The degrees of this structural injury are three.

1. There may be *rupture of the smaller vessels*, the blood from which infiltrates the cellular tissue, and causes an ordinary *ecchymosis*.

2. A *large vessel* may be ruptured, so that blood is effused in considerable quantity, and tears up the cellular tissue, in which it coagulates; or if an artery is ruptured, a false or diffused aneurism may be the result.

3. The tissues may be irretrievably pulpified and *disorganised*; as happens from the contact of a spent cannon-ball for instance.

ECCHYMOSIS.—When ecchymosis has been produced in the skin or immediately beneath it, there appears a swelling of a reddish colour, which speedily becomes black. On the third day it is violet, and the margin which was at first well defined, is found to be faint and diffused. About the fifth or sixth day the colour becomes green; on the seventh or eighth, yellow; and it gradually disappears about the tenth or twelfth—sooner or later, according to the vigour of the individual and the quantity of blood effused.

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* It may be worth knowing for medico-legal purposes that a punctured wound made with a *circular conical weapon* is not *round* but *linear*, as though it had been made with a narrow, flat instrument.

If an ecchymosis be formed in the cellular tissue without injury of the skin, no discoloration may appear for twenty-four hours;—and if it be more deeply seated among the muscles, it will not affect the skin for some days, and may then appear at a part quite remote from the seat of injury;—and, in this last case, will usually be in the form of irregular yellow spots, marbled with green and blue.*

CAUSES.—Ecchymosis may be produced by many other causes besides contusions. It is a symptom of certain diseases, as scurvy, purpura, and the last stage of fevers. It may be a consequence of oblique wounds, which do not permit the blood to flow freely out;—of spasms, and other violent contractions of the muscles;—it may also be caused by suction (as after leech-bites), especially in a part where the skin is thin. It may further be simulated by the application of colouring matters to the skin. Lastly, ecchymosis produced during life may require to be distinguished from various appearances arising after death.

DIAGNOSIS.—*Ecchymosis produced by suction* may be distinguished from that which is the result of injury, by being generally in the form of small round spots, and situated on the inside of the arms, or female breasts; and the surgeon required to decide on the cause of such marks should consider whether they correspond in their appearance to the date which is assigned to them.

Artificial discoloration of the skin may be distinguished from ecchymosis by its being generally in round or irregular spots, fringed at the edges.†

Ecchymosis produced during life may be distinguished from the livid discoloration of *incipient putrefaction*, or that which is caused by the gravitation of blood in a dead body, by noticing that in the first case, blood is effused into the cellular tissue, and is incorporated with the cutis, which is thickened; whereas in the latter two cases, the blackness will be confined to the surface of the cutis, and if blood is effused into the cellular tissue, it will be only at some depending part, and will be fluid, and not coagulated.‡

TREATMENT.—The indications are, (1) to check extravasation of blood; (2) to prevent inflammation; (3) and afterwards to produce absorption of the effused fluids and restore the use of the parts.

If the patient be robust, and the bruise seated on the head or trunk, and the swelling increase rapidly, and become very tense, it may be expedient to bleed. The bruised part should, if possible, be placed in a raised position;—and cold or iced water, or a bladder containing a *frigorific mixture*, F. 114, should be applied at once;—and a sufficient number of leeches, as soon as there are any signs of inflammatory pain and swelling, but not before. These measures, together with purgatives and low diet, will suffice for the first two indications; —whilst the third will be fulfilled by friction with stimulating liniments; by cold affusion; and passive motion after inflammation has subsided. The roots of briony, and Solomon's seal, bruised, and applied as a poultice, and the tincture of arnica, appear to have some efficacy in hastening the disappearance of bruises.

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* Devergie, Médecine Légale. Paris, 1836, tome ii. p. 57.

† Fallot de la Simulation et de la Dissimulation des Maladies. Bruxelles. 1836, p. 67.

‡ Beck's Medical Jurisprudence.

Sometimes, however, the effusion of blood increases very fast, and the tumour becomes tense and shining, so as to threaten rupture of the skin. It will be well in this case to imitate the practice of prize-fighters, and make a very small aperture with the point of a lancet, and let as much blood be sucked out as can be without difficulty; although this should not be done unless absolutely necessary, because the pressure of the blood already effused tends to prevent the escape of more. If, however, this cannot be done, because the blood has coagulated,—and if the skin is so tense that it will inevitably either burst or slough,—and if the pain and tension are not adequately relieved by the free employment of antiphlogistic measures, so that the clot, instead of being absorbed, will be removed by suppuration, an incision of sufficient length should be made into the swelling, and a poultice be applied. Then the clot will most likely be gradually extruded by the contraction of the cavity, and a simple granulating wound will be left. But it is a very bad practice to squeeze or scoop out the coagulum, as the bleeding might be brought on afresh, and severe inflammation be excited.*

If an artery of considerable size is lacerated, which will be known by the situation of the contusion, and the great and rapid swelling, the case must be treated as a *diffused aneurism*.

If the fingers or toes have been severely bruised, so that it may seem impossible to save them, still they should not be too hastily amputated, as they often recover under unfavourable circumstances.

If any bruise be attended with severe collapse, the measures described in Part I., Chapter I., must be adopted. In no case should cold be applied if it make the patient shiver uncomfortably; nor should it ever be applied extensively to the trunk; extensive superficial extravasation (to counteract which it was recommended above) rarely occurs there;—and if there be extravasation into the cavities, it must be combated by bleeding.

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* Hunter on the Blood, part ii. chap. ii. sect. i.

SECTION II.—OF LACERATED AND CONTUSED WOUNDS.

General Description.—These wounds are attended with less hæmorrhage than the incised,—both because their surface being irregular, renders it easy for the blood to adhere and coagulate,—and because arteries, when torn, do not bleed so much as when cut. But in all other respects they are infinitely more serious. (1.) They are liable to inflame violently and slough; (2.) they are often complicated with foreign bodies; and (3.) they are more liable than simple wounds to occasion severe constitutional disturbance and tetanus.

Treatment.—In the first place, bleeding must be restrained ;—secondly, foreign bodies must be removed ;—thirdly, the divided parts must be brought into apposition, in case the whole or any part of them may be inclined to unite by adhesion. Then the patient must observe rest, the diet be moderate, and the bowels be opened ; a cloth dipped in cold water, or a soft poultice, or the water-dressing, or a poppy fomentation, may be applied locally. The tincture of Benzoin on lint is often highly useful, sealing up the wound as it were from the contact of the air, and disposing it to heal kindly. The patient must not be reduced too much, or tetanus will be more liable to come on. Openings are to be made if necessary, in order to prevent the lodgment of putrid blood in the early stages, and of matter subsequently. When sloughs have separated, and suppuration is kindly established, the parts should be brought into apposition, a smuch as can be done without leaving sinuses, and the case must then be treated as an ordinary sore.

CHAPTER IV.

OF GUN-SHOT WOUNDS.

Definition.—Under the term *gun-shot wounds* are included all the injuries caused by the discharge or bursting of fire-arms. They consist, of "severe contusions, with or without solution of continuity."

Symptoms.—When a musket or pistol-ball has penetrated an ordinary fleshy part, there is seen a hole, perhaps rather smaller than the ball itself, with its edge livid and *inverted;*—and if the ball have passed completely through, there will be another larger and more ragged orifice, with its edge *everted.* The wound will, besides, be attended with more or less *pain*, *hæmorrhage*, and *constitutional disturbance.*

(*a*) The *pain* in these cases is said, by most authors, to be inconsiderable at the moment of infliction. Mr. Guthrie, however, both from observation and personal experience, affirms that this is by no means the case, and says that in general the pain is severe;—that it is a dead, heavy, painful blow;—although still the injury may not be felt at the moment, if it is inflicted while the patient's whole attention is absorbed by other objects.

(*b*) Most authors state that gun-shot wounds are attended with very little *hæmorrhage*, unless some considerable blood-vessel has been divided. But Mr. Guthrie asserts that this is equally erroneous; that there is in general considerable hæmorrhage of an arterial colour; but that a wound of a large artery is only to be feared if the blood continue to be poured out in great quantity and *per saltum*, in spite of pressure.

(*c*) The *constitutional disturbance* accompanying these wounds is severe and peculiar. The surface is pale, and bedewed with cold perspiration;—every limb trembles; the patient cannot stand without support; and suffers from vomiting, faintness, and peculiar alarm, anxiety, and confusion of the mind. The severity of these symptoms will, in general, be determined by the extent of the injury, the importance of the part wounded, and the habitual fortitude of the sufferer; but the anecdote related in the subjoined note will show that they may be most severe under circumstances the most trivial.*

EFFECTS OF BALLS.—A ball in penetrating or perforating the animal body bruises and pushes aside the tissues in its course, making a conical passage, of which the apex is situated at the entrance, and the base at the exit of the projectile. This arises from the fact that the oscillations of a ball are in the inverse ratio of its velocity; so that the greater the resistance opposed, the greater the mischief; hence it appears that if a ball meets with soft parts only, the havoc will be less, and the track of the wound narrower, in proportion to its velocity.†

COURSE OF BALLS.—A remarkable circumstance connected with gun-shot wounds is the facility with which the ball may be diverted from its course by the slightest obstacle. Any trifling obliquity of surface, or difference of density in the parts which it traverses, may cause it to take a most circuitous route. Thus a ball may enter on one side of the head, chest, or abdomen, and may pass out at a point exactly opposite, just as if it had gone entirely through the cavity, whereas it may be found to have travelled round beneath the skin. Sometimes it will make a complete circuit, as in the case of a friend of Dr. Hennen, who was struck about the *pomum Adami* by a bullet, which passed completely round the neck, and was found lying in the very orifice by which it entered. The track of the ball in these cases will often be indicated by a blush, or dusky red line, or wheal on the skin, or sometimes by a peculiar emphysematous crackling;—and the diagnosis will of course be aided by the presence or absence of the symptoms of wounds of the great cavities. In a similar manner balls will run along concave surfaces. Thus a soldier may be struck on the wrist when the arm is bent in the act of firing, and the ball may graze along the arm, and fly off at the shoulder; or a ball may strike the outside of the calf of a mounted officer, and be thrown up into the popliteal space; or one may enter the thorax or abdomen, glide along the inner surface of the peritonæum or pleura, and pass out or be lodged near the spine.

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* During a rapid advance of part of the British army in Portugal, "one of the skirmishers suddenly came upon his adversary, with only a small bank between them; both parties presented, the muzzles of the pieces nearly touching; both fired, and both fell. The British soldier, after a minute or two, thinking himself hit, but still finding himself capable of moving, got up, and found his adversary dead on the other side of the bank. I saw him," says Mr. Guthrie, "immediately afterwards in considerable alarm, being conscious of a blow somewhere, but which, after a diligent search, proved to be only a graze from a ball on the ulnar side of the arm; yet the certainty he was in of being killed, from the respective positions of the parties, had such an effect upon him at the moment of receiving this trifling injury, as nearly to deprive him for a short time of his powers of volition; whereas, had the wound been received from a concealed or distant enemy, it would in all probability have been little noticed."—Guthrie, op. cit. p. 11.

† Baudens, Clinical Lecture on the wounded of the French Revolution of February, 1848; Lancet, 1848, vol. ii. p. 336.

LODGMENT OF BALLS.—It is always important to ascertain whether the shot has passed out of the body, or whether it is lodged;—and supposing that there are two holes, it must be considered whether they are produced by the *entrance* and *exit of one*, or by the *entrance of two* distinct balls. If there are two holes, and they are distant from each other, some light may be thrown on the question by ascertaining the position of the patient at the time he was wounded, and the posture of his assailant. Thus a soldier has presented himself with two shot-holes, one on the outside of the ankle, the other near the trochanter; but they were both caused by the same ball, which entered at the ankle when the foot was raised in the act of running.* In another instance, a soldier, who was ascending a scaling ladder, was wounded in the right arm, and the ball was found under the skin of the opposite thigh.† But even though there may be but one opening, it by no means follows that the ball has lodged; for it may have escaped by the very hole at which it entered, after having made the circuit of the body, as in the case of Dr. Hennen's friend just mentioned. Or it may have impinged against some part, such as the cartilage of a rib, which has caused it to recoil; and a ball has been known to drive a piece of bone into the brain, and fall out of the wound afterwards. In some instances a ball has been unable to perforate a fold of linen, but has carried it for the distance of one, or even three or four inches into the wound; and on drawing this out, the ball of course comes out with it.‡

Again, it is very possible that two balls may enter by the same aperture, one of which may pass out, and the other diverge and wound some important organ. So that, in many cases, the prognosis should be guarded, especially if the state of constitutional alarm and depression, instead of diminishing, increase considerably, and disproportionately to the apparent extent of the injury. Sometimes it will happen that a ball splits, either from a defect in the casting, or from its striking against some sharp bony ridge, as the vomer or shin.[*]

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* Guthrie, op. cit. p. 17.

† Hennen, op. cit. p. 35.

‡ A silk handkerchief sometimes saves life in the same way; and Mr. Home, in his Report on Gun-shot Wounds in Canada, in 1838, speaks of the great power which the canvas lining of soldier's stocks has in resisting the passage of balls.—Edinburgh Med. and Surg. Jour., July, 1840.

But it frequently happens that large masses of metal are impacted in the substance of a part without much external indication of their presence, it appearing as though they made room for themselves by compressing the surrounding soft parts.[†]

Foreign Bodies.—Gun-shot wounds may be complicated by the presence of other foreign bodies besides the ball; and these are divided by Dr. Hennen into two classes; namely, 1st, pieces of the clothing, or of matters contained in the pockets, or portions of the body of some unfortunate comrade;[‡] 2dly, pieces of bone or muscle belonging to the individual, but which have become virtually extraneous, in consequence of being dead and detached. These are infinitely more mischievous than the former. It must be recollected that although there may be no *ball* in a gun or pistol, yet the *wadding* may act as a ball, if the piece is discharged close to the body. The surgeon in civil practice who examines a gun-shot wound inflicted with intent to murder, should always save the wadding if he finds any, as it may afford a clue to the detection of the murderer.

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[*] A Brunswick soldier at Waterloo "was struck by a musket-ball on the tip of the nose, which split upon the bony edge where joined by the cartilage. A piece of the ball was extracted on the spot, and it was supposed that the ball itself had been purposely cut into pieces, as is sometimes done by foreign riflemen. The cure went on without accident until the tenth day, when the man was seized with a violent hæmorrhage from the nose and mouth, which came on suddenly, and carried him off in the course of the night. On dissection, it appeared that a very minute portion of the ball had penetrated along the basis of the skull, and lodged in the sinus of the left internal jugular vein, forming a sort of sac for itself close upon the vein, and having inflamed the coats of the vessel, they at last ulcerated and burst."—Hennen, op. cit. p. 91.

[†] Hennen relates the case of a young officer who was killed at the siege of Seringapatam by a cannon-ball of thirty-two pounds, which completely buried itself in the muscles of his hip. A mass of grape-shot, the size of the closed fist, has been extracted from under the plantar aponeurosis. Guthrie gives a case in which a ball of eight pounds' weight lodged in the thigh without making a large opening, and was not discovered till it accidentally rolled out on amputating the limb.

[‡] A pocket of coarse linen, containing two five franc pieces and two copper coins, has been extracted after some days from the vastus externus muscle, in which it was deeply imbedded. Three pieces of coin were extracted on the fifth day after the battle of Waterloo, from a wound in the thigh of a poor Hanoverian soldier. As he possessed neither money nor pocket to put it into, the coins evidently came from a comrade who stood before him, and who was killed by the same shot. Part of the cranium has been found imbedded in the thigh,—a tooth in the temporal muscle,—and the olecranon of one man in the bend of another man's elbow.

Spent Balls.—Injuries from spent cannon-balls have at all times attracted great attention from the extreme violence of the injury inflicted, and the very little external appearance of it. In some rare cases a cannon-ball has passed close to the head, and has caused death, either immediately or within a few hours, without leaving any morbid appearance that could be detected by dissection.* But in the majority of instances it is found, that although the skin may be intact, or but trivially grazed, still that the parts beneath have been irreparably disorganized;—the muscles pulpified, the bones comminuted, and large vessels and nerves torn across. The patient is severely stunned; and the part injured is motionless, and senseless, and benumbed for some distance. Swelling soon comes on, but more from extravasation, than from inflammation, which, although attempted to be set up, never attains any height. Gangrene follows speedily, and is propagated to the neighbouring parts, weakened as they are by participation in the injury, and by their contact with tissues that have ceased to live.

These cases were formerly called *wind contusions*, being ascribed to a compression and displacement of the air by the ball; but the subjoined quotation from Baron Larrey offers the most probable explanation of the phenomenon.†

Small Shot, discharged from a fowling-piece or pistol, produce different effects, according to the distance at which they strike. If the distance is great, they will in all probability be scattered, and fall singly; *peppering* the victim smartly, but not penetrating beyond the subcutaneous tissue, nor doing much harm unless one of them strike the eye. But if the distance is small, so that they strike *en*

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* A lad was carrying a sand-bag on his head, when it was struck by a twenty-four pound shot from a distant battery. He immediately fell, senseless and comatose, with a slow, weak pulse, labouring respiration without stertor, and incessant attempts to vomit. The pupil of one eye was dilated and motionless, that of the other natural; the hair along the sagittal suture was erect, resembling that of a person placed on the insulating stool and electrified. In this state he remained for twenty-four hours, and then expired in convulsions. No cause of death was discovered on a minute examination, so that it must be attributed to a violent concussion; but it is remarkable that the ball should cause such a concussion, without also causing some more palpable lesion.—Hennen, p. 96.

† "A cannon-ball is propelled at first with a rectilinear movement; and if, during this part of its course, it strikes against any part of the human body, it carries it away; but the ball, after having traversed a certain distance, undergoes some change in motion, in consequence of the resistance of the atmosphere, and the attraction of the earth, and turns on its own axis, in addition to the direct impulse received from the explosion of the powder. If it should strike any part of the body when the velocity with which the ball is passing is greatly diminished, it does not carry it away, as in the preceding case; but in consequence of its curvilinear or rolling motion, it turns round the part, in the same manner as a wheel passes over a limb, instead of forcing a passage through it. The soft elastic parts, such as the skin and cellular membrane, yield, whilst the bones, muscles, tendons, arteries, &c., offering a greater degree of resistance, are either bruised or ruptured. If the ball should strike one of the cavities of the body, the viscera suffer in like manner."—Mem. de Chir. Mil. quoted by Guthrie.

masse, their effects are far more destructive than those of a bullet, for they spread *in* the flesh, and so cause greater laceration, besides the mischief arising from their lodgment in the tissues.

GUN-SHOT FRACTURE.—When a ball, propelled with great velocity, strikes against bone of compact tissue, such as the body of the femur, it produces a comminuted fracture of the worst description, shivering the bone into splinters, and often splitting it up for great distances. But when the velocity of the ball is very slight, it may be flattened, and rebound, or may, if it strike a sharp edge, such as the spine of the tibia, be itself split into pieces. If it strikes the cancellated tissue, it will probably bore a canal through it, of which the exit may possibly be twice as large as the entrance. If the propelling force be nearly exhausted, the ball may lodge in the cancellous tissue; forming for itself a kind of chamber in which it may be easily moved or shaken, but from which it is very difficult to extract it, in consequence of the small size of the entrance. If the ball penetrate the cancellous texture very near a joint, it will most probably shiver the bone between its course and the joint. If it strikes a bone obliquely it may dig out a longitudinal groove without fracture.

PROGRESS AND CONSEQUENCES.—*In favourable cases.*—Inflammation generally comes on in from twelve to twenty-four hours after a gun-shot wound of some common part. The wound becomes swelled, stiff, and painful, and exudes a little reddish serum. On the third or fourth day pus begins to be formed: but the suppuration is limited by the effusion of lymph around the wound. About the fifth day the parts in the immediate track of the ball, which have been killed by the violence of the contusion, begin to separate, and change from a blackish red to a brownish yellow colour ;—and on the tenth or fifteenth day, sooner or later, according to the vigour of the constitution, the slough is thrown off.* In the mean time granulations form, the wound contracts and becomes impervious at the centre, and generally heals with a depressed cicatrix by the end of six weeks or two months,—the lower aperture always healing first. These are the symptoms observed in healthy constitutions, and they will be attended with little constitutional disturbance, and that of no long duration.

Inflammatory Complication.—But if the patient, previously to the receipt of his wound or after it, has committed excesses, or has been exposed to vicissitudes of temperature,— or if the wound has been irritated by want of rest, or improper applications, the local and constitutional affections are much more formidable. The pain is more severe, the redness and swelling more extensive, the wound dry, and fever violent. When suppuration is established, instead of being confined to the track of the ball, it is diffused amongst the neighbouring muscles and under fasciæ, forming numerous and irregular sinuses;

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* It is by no means true, as is generally stated, that the whole track of the ball must slough, for the separated parts are never equal in extent to the depth of the wound.—Guthrie.

—so that the treatment is protracted for many months; and even after the cure is completed, the limb remains disabled by contractions and adhesions of the muscles, and is liable to œdematous swellings from the structural and vital weakness which a continuance of inflammation always induces.

Lodgment of Foreign Bodies.—If the ball or any other foreign bodies remain lodged, the present inflammation and constitutional disturbance will be proportionally more severe, and the resulting suppuration more profuse and exhausting; and it will besides be accompanied with more or less pain, till the exciting cause is got rid of. But if the constitution or parts do not possess much irritability, if the ball be small and polished, and if it press against no nerves, or vessels, or other sensitive parts, it may, and often does, remain for years without creating any disturbance—a cyst being formed for it in the belly of a muscle, or in the interstitial cellular tissue.

Rare Complications.—Mr. Guthrie has described two rare and peculiarly fatal forms of inflammation occasionally supervening on gun-shot wounds. The *first* is a most acute inflammation, attacking the muscles and other deep-seated parts, with very little affection of the skin. In the instances related, the wounds were apparently going on well, when they became extremely painful towards evening; the pain increased during the night, and death occurred before morning. "On dissection," says the learned author, "the whole limb seemed so stuffed or gorged with blood, that the texture of the parts, muscular as well as cellular, was soft, and readily gave way to a moderate pressure with the fingers. I can only compare it to the appearance of a part just falling into a state of gangrene."

The *second* variety made its appearance after the first two days, and in every case which Mr. G. saw, the wound was in the upper extremity. The part swelled, and was rather œdematous, and affected with a burning pain: the skin was bright and glossy. In fatal cases, the swelling rapidly extended up to the axilla, and then difficulty of breathing came on, and was soon followed by death. One patient only, out of six, was saved, by the most vigorous antiphlogistic treatment. The first three cases were not examined after death; in the fourth, the great veins were inflamed, and in the fifth there was effusion into the chest.

Mortification supervening on gun-shot wounds may occur under the following conditions:—(1.) When the injured parts are irrecoverably disorganised, so that they immediately cease to live; which sometimes happens to the tissues in the immediate track of a musket-ball, or to a whole limb struck by a spent shot. (2.) From excess of inflammation following a wound;—especially if the excess is due to a disordered state of the constitution. (3.) From division of the great arterial and venous trunks. This is indicated by its commencing in the extremity of the limb; the foot or the hand for instance; and it presents a combination of the two forms of dry and humid gangrene. The most distant parts become cold, pale, and insensible: this state spreads up the limb; then the patient complains of pain and numbness; and the parts above those which are actually dead become slightly tumefied and discoloured. In the course of three or four days heat and redness supervene, and the swelling greatly increases. The constitution now becomes affected with restlessness, anxiety, and fever;—the swelling rapidly increases, with great pain, the skin being yellowish and streaked with bluish lines. The patient mostly sinks;—there being but few cases in which, if the first stage has passed by, and the constitution has become affected (as indicated by the rapid extension of the gangrenous swelling), there will be power to arrest the disease, and form a line of separation.

Secondary Hæmorrhage.—This is the last complication of gun-shot wounds that will here require notice. It may be caused, *first*, in consequence of excessive arterial action, by which the coagula in the mouths of the divided vessels are displaced. This may occur at any time from the first day till the fifth. *Secondly*, by the separation of a slough from a large artery. This may occur from the fifth till the twentieth day; and it is this peculiar variety of secondary hæmorrhage which is generally thought to be so frequent in its occurrence, but which, as Mr. Guthrie asserts, does not happen in more than three or four out of a thousand cases. *Thirdly*, from ulceration of the coats of an artery; and this may happen at any time until the wound is healed. The *fourth* and most common variety is a real *inflammatory hæmorrhage;* the blood not being poured out from any particular trunk, but exuding from the general surface of a granulating wound. This kind of hæmorrhage may be caused by everything capable of exciting the circulation;—by excess in food, drink, or muscular exertion, and particularly by venery;* and the same causes will, of course, tend greatly to induce either of the other varieties.—It is most liable to occur in persons of a sanguine temperament, and especially if they have been exposed to the close air of a crowded hospital. The hæmorrhage is preceded in these cases (and in the other varieties also, if partially induced by the same causes) by pain, heat, and throbbing of the wound.

TREATMENT OF GUN-SHOT WOUNDS.

Of Simple Cases.—When a ball has passed completely through some common fleshy part, such as the thigh or buttock, the wound should be sponged clean;—and when the ordinary hæmorrhage is arrested, a piece of lint should be applied and secured by two or three cross strips of plaster. Tremor and mental confusion may be allayed by a mouthful of wine or spirits, and by a few consolatory words from the surgeon;—or, if severe, by an opiate. When they have subsided, a compress, wetted with cold water, will be the only other application needed. If the patient can be kept at rest in bed, all bandages, at this stage, will be unnecessary and injurious. In military practice, one or two turns of a roller may be necessary to keep on the dressings, but they should not be applied with any degree of tightness;—and, as a general rule, their application on the field of battle should be as limited as possible, lest there be a deficiency of them in the later stages of treatment, when they can scarcely be dispensed with.

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* The tendency of the great excitement produced by the venereal orgasm to cause hæmorrhage is well known. Hennen (p. 189) enumerates three cases; in the first of which, fatal hæmorrhage from the lungs took place from this cause; in the second, "an officer died from uncontrollable bleeding from an amputated arm, from the same;" in the third, "a young officer with an amputated thigh, which was healed within half an inch, had, seven weeks after the amputation, an hæmorrhage so violent from an excess of this nature, and a subsequent opening up of the stump to such an extent, as detained him under cure for three months longer." Instances of death in coitu are mostly to be assigned to the same cause.

These primary dressings need not be removed for the first three or four days; and if they have become dry and stiff, they should be well moistened with warm water previously to their removal. During the succeeding inflammatory stage, there is the choice of hot or cold applications, each of which has its advocates. Mr. Guthrie greatly prefers the use of cold water;—but if it make the patient feel chilly or uncomfortable, or if it augment stiffness and pain, warm poultices, or the water-dressing should be substituted. But it is found that the too frequent use of poultices weakens parts, and renders them incapable of the necessary restorative actions; whilst they too often serve as a cloak for negligence, and prevent the adoption of more active measures;—in fact, the experienced military surgeon just quoted considers a poultice applied to a compound fracture, or wounded joint, as the sure precursor of amputation. When suppuration is well established, the cure is to be completed by mild stimulating lotions and bandages. Particular care must be taken to prevent sinuses, by pressing out all stagnant matter, and preventing its accumulation by compresses; or by free openings, if requisite, to ensure its discharge. Gentle friction and passive motion are the best means for preventing or removing subsequent stiffness. The *constitutional treatment* must be antiphlogistic. If inflammation be slight, purging, low diet, and rest, may suffice; but if it be severe, and the patient robust, bleeding may be employed freely.* A combination of sulphate of magnesia and tartar emetic, F. 40, is a most convenient form for the military surgeon. *Leeches* may be applied to allay inflammation. *Opiates* should be given at bed-time, if there be much spasmodic twitching and pain.

Superficial wounds, made by musket or cannon-balls, are to be treated in the same way. It must be recollected that cold lotions are never to be extensively applied to the trunk.

Dilatation or Debridement.—The same observations are to be made concerning the dilatation of gun-shot, as of punctured wounds.† A man is not to have his skin gashed merely because he has been shot.

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* Soldiers, from their generous diet, active exercise, and regular discipline, bear depletions of every kind much better than rustic labourers or mechanics, although, perhaps, the latter may be more ruddy and healthful in appearance.

† Yet we read of the orifices of these wounds being scored in a radiated

But if there be great swelling of muscular parts confined by fasciæ, or if matter form in the same, there can be no doubt of the propriety of a sufficiently long and deep incision to relieve tension and discharge matter. Dilatation may also be required in compound gun-shot fracture, to remove splinters of bone.

The two peculiarly fatal forms of inflammation specified by Mr. Guthrie are to be combated by vigorous antiphlogistic measures and incisions.

FOREIGN BODIES.—In *every case* the surgeon should ascertain whether foreign bodies are lodged in the wound; for even although it may be satisfactorily demonstrated that the *ball* has passed out,—or although there may be a mere laceration from grapeshot or shell, still pieces of the clothing or other matters may remain in the wound. If there is only one opening, such an examination is indispensable. The parts should be put as much as possible into the posture they were in when the injury was received; and the finger should be passed in as far as it will reach, counter-pressure being at the same time made on the opposite side of the limb. In unimportant parts, the finger may be aided by a long probe or bougie, or a deeply-seated ball may sometimes be detected by a long, fine acupuncture needle.

If the foreign body is found lying under the skin, it should be immediately removed by an incision, which will require to be larger than at first would be imagined. Pressure should be made to prevent the ball shifting its place during the incision, otherwise the operation will be long and vexatious. If the foreign body is near the wound, it should be removed by forceps,—the simpler the better. The orifice will mostly require to be dilated for this purpose, because from the natural elasticity of the skin, and the ensuing tumefaction, it will be too much contracted to allow the ball to pass out again.

It is a well-established rule, that on no account are incisions to be made for the removal of foreign bodies, unless they are certain of being successful; both because of the fruitless pain created, and because of the depressing effects of a failure on the patient's mind. The vulgar attach peculiar importance to the extraction of the ball, and think that the patient's safety greatly depends on it; but, in reality, leaden bullets cause very little inconvenience indeed, unless they happen to press on some organ of consequence. If, therefore, a ball is lodged in the middle of the thigh or other thick fleshy part, and from the direction of the wound it cannot be extracted without a very considerable incision, it should be left to itself;—and it will probably be either brought within reach by the natural contraction of the parts, and by the flow of matter, or it may become encysted, and give no further trouble. Bullets that have become encysted are to be cut out, if they come near the skin, or if, during any of their extraordinary changes of position, they impede the functions of any important part, otherwise

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manner by foreign surgeons, as though in compliance with some religious ordinance. Sir C. Bell's Dissertation of Gun-shot Wounds, p. 459.

they are to be left to themselves. The cyst that envelopes them is frequently so dense, and adheres so firmly, that a portion of it must be removed at the same time.

If a ball has lodged in the substance of a bone, it should be removed by a chisel, or trephine; otherwise caries, or necrosis, and so much mischief as to necessitate amputation, may follow. In a few rare cases, however, balls have remained imbedded in bone, without mischief.

SECONDARY HÆMORRHAGE.—The first three varieties of secondary hæmorrhage, described at p. 127, require the ligature; the *fourth* is to be treated by rest, by the application of cold or iced water, or by ice itself;—by pressure on the bleeding surface, or on the arterial trunks above;—and if the blood seem to ooze from any particular spot, it may be touched with nitrate of silver. If there be fever and plethora, bleeding and purging;—if weakness and irritability, tonics, opiates, and the mineral acids;—and, in all cases, removal from a crowded hospital will be expedient.

NECESSITY OF AMPUTATION.—It will not be wondered at, that this operation will be frequently required in gun-shot injuries of the limbs, on account of the fracture and comminution of bones, the exposure of joints, the division of blood-vessels, and the irreparable violence inflicted on the skin and soft parts.

The points for consideration in determining its necessity are twofold;—viz. 1st, Would the preservation of the limb endanger the patient's life?—and, 2ndly, supposing that it would not, would the limb be of use, if saved? In deciding on the first point, we must be guided by the patient's *age;* for an old person would succumb to an injury that a young one might recover from;—by his *habits*,—for temperance, sobriety, and a well-disciplined mind, will be greatly in his favour;—by *previous disease*,—for (as has already been insisted on*) if there be organic disease of any viscus, the patient will be infinitely more liable to sink;—lastly, by the *supply of necessaries*, and extent of accommodation;—hence, in compound fractures, and other cases demanding perfect quietude, many more limbs may be saved in civil practice than in the accidents of naval and military warfare.

PRIMARY OR SECONDARY?—But, supposing amputation to be decidedly required,—that the limb, if preserved, could be but a burden to the patient, and that the attempt to preserve it would endanger his life;—the question next arises, whether amputation ought to be *primary;* that is, performed within the first forty-eight hours, before fever and inflammation have set in;—or whether it ought to be *secondary;* that is, delayed till inflammation has subsided, and suppuration is established,—which is not generally the case in less than from three to six weeks.

Now this question is one which cannot be decided by argument, but by experience; and the general experience of modern military surgeons has decided that amputation when necessary ought to be primary. We may gather from Mr. Guthrie's* works, that the loss after secondary operations is at least three times as great as that after primary.

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* Part I. chap. i.

Hunter, however, and some surgeons before his time, advocated secondary amputation; the arguments in favour of their practice being, that persons in a rude state of health do not bear operations so well as those who have been labouring under some chronic suppurating complaint of the part to be removed; and that if the patient is not able to support the inflammation arising from the accident, it is more than probable that he would not be able to support the amputation and its consequences;† and further, that the patient is liable to sink sooner or later from the shock of the amputation speedily succeeding that of the injury. Moreover, Mr. Alcock, surgeon to the Anglo-Spanish legion, found in his practice, that secondary was less fatal than primary amputation.‡

But it may be seen at a glance, that there is not one reason in favour of secondary amputation that is worth much. For, in the first place, it must be evident that many will die of the inflammation of an extensive lacerated and contused wound, who would not die of the minor inflammation arising from a clean incision; and that many will die of secondary amputation, when exhausted by suffering, and weakened by confinement in an hospital, who might have survived a primary operation. In the second place, Mr. Alcock's experience in Spain is neutralized by another isolated set of cases, viz., the secondary amputations after the battle of Navarino, all of which proved fatal.§ And lastly, it must be recollected that the question is,—not whether a hundred men just wounded and requiring amputation are more likely to survive it than a hundred who have gone through the ordeal of six weeks in an hospital;—but whether the first hundred would live to that period; which most probably they would not.

When amputation is decided upon, it should then be primary. But there are two errors as to time, that even here must be avoided. The first is, that of *amputating too soon*;—of "letting the knife follow the shot," before the patient is in any measure recovered from the immediate shock and collapse; the second is, that of *waiting too long*, so that he becomes exhausted by pain. Therefore, when a patient is brought to the surgeon with a limb knocked off, and with a low pulse, cold skin, hiccup, fainting, or other symptoms of extreme collapse, the first endeavour should be to comfort him; to explain the nature of his loss; to assure him of his safety, and to administer small quantities of wine or cordials, and apply warmth; at the same time providing by the torniquet against immediate peril from bleeding. And in this way, by waiting an hour or two, the agitation of mind and body will be appeased, and the operation may be performed without further delay. But if the pain be so intolerable that the patient eagerly demands to be relieved from his sufferings, the request should be immediately complied with; for the shock of the operation will be infinitely less detrimental than the endurance of such torments.

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* Guthrie, op. cit. p. 224. See also Clinical Lecture in Lancet, 1848, vol. ii. p. 522.

† Hunter on Gun-shot Wounds.

‡ Notes on the Medical History of the British Legion in Spain, by Rutherford Alcock, K.T.S. Lond. 1838.

§ Lizars' Practical Surgery.

Care should always be taken, before amputating, to *ascertain the whole amount of injury;* for it would be of little use to cut off a leg, if the patient was shot through the liver.

If, from any unavoidable circumstances, the favourable period has elapsed, and violent fever and inflammation have set in, still the operation must be done without delay in some few cases, to give the patient a chance of surviving. But, in the majority, free antiphlogistic measures should be first employed; and then, "On the very day," says Hennen, "that a subsidence of fever is effectually announced by a free and healthy suppuration, by the abatement of local inflammation; by a restoration of the skin to its functions, demonstrated by returning coolness and elasticity, particularly on the affected limb; we should proceed to perform our amputation on those patients in whom no hope of an ultimate recovery without it can be entertained."*

Rules for Amputation.—1. When a limb has been completely knocked off by a cannon-ball, the stump must be amputated; and if the bones be splintered and shattered up to the next joint, or if the wound be so near the joint that mischief is to be apprehended, the operation must be performed above it.

2. Gun-shot fracture of the femur always requires amputation, and so does division of both femoral artery and vein, or of the sciatic nerve. But it is not necessary for considerable destruction of the soft parts, provided the bone, vessels, and nerves are intact, and that there are conveniences for the cure.

3. Injuries of the knee, or ankle-joints, or extensive fracture of the tibia, with division of the arteries, require it, but not mere laceration of the calf.

4. The arm should not be amputated for almost any *musket-shot* injury. If the head of the humerus is shattered, it should, if possible, be sawn off;—if the elbow is shot through, it may be cut out;—if the humerus is splintered, the splinters must be extracted; and the forearm will bear so much fracturing and cutting, that it should not be condemned without very great injury both to bones and arteries. But extensive injury of the wrist-joint, or of the humerus, with division of the vessels, generally requires the operation.

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* Hennen, op. cit. p. 256; Guthrie, Clin. Lect. Med. Gaz., March 10th, 1838. Sir G. Ballingall's Military Surgery, p. 219, et seq.

5. When a main artery is wounded, and gangrene is commencing and spreading beyond the toes or fingers, amputation should be performed just above the level of the wound.

CHAPTER V.

OF THE EFFECTS OF HEAT, BURNS, AND SCALDS.

THE degree of heat which can be borne without inconvenience or injury, depends very much on the conducting power of the medium through which it is applied. Thus, Sir C. Blagden and Dr. Fordyce * ascertained by experiment, that the body may be exposed to air (whose conducting power is almost a nullity) of a temperature above 212° without injury; whereas the contact of a *solid* or *fluid* of the same heat would instantly cause burning. Again; some parts of the body will from habit tolerate a degree of heat that would be extremely painful to others.

DIAGNOSIS.—It is sometimes important in medico-legal investigations, to determine exactly the manner in which burns have been inflicted. Those caused by the contact of heated liquids are generally diffused in their extent, and equable in their severity; they are also generally superficial ; for the heat of boiling-water is not sufficient to cause the death of the cutis, unless immersed in it for some time; although that effect may be readily produced by boiling soap or oil, or other liquids whose point of ebullition is high. Burns caused by some sudden and intense heat of short duration,—as by the ignition of turpentine or gunpowder, or the inflammable gases, are more diffused, uniform, and regular than those occasioned by the contact of heated substances—and all the hair is burned off smoothly.

After burns from the explosion of gunpowder, the injured parts are said to be of a peculiar bluish white. The irritation of these injuries is often aggravated by the numerous grains of gunpowder that escape combustion, and are projected with such force as to stick into the skin. In many cases, caused by the explosion of gas in coal mines, particles of the coal-dust adhere to the skin in the same manner.

DIVISION.—The most useful division of burns, for practical purposes, is the three-fold one which has existed from time immemorial, into, 1st, burns producing *mere redness;* 2ndly, those causing *vesication;* 3rdly, those causing *death of the part burned.*

1. The first class are attended with mere superficial inflammation, terminating in resolution, with or without desquamation of the cuticle.

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* They found that they could bear the contact of heated spirits when cooled down to 130 degrees; of oil at 129; water at 123; quicksilver at 117. Vide Phil. Trans. vol. lxv.

The pain is philosophically said to consist of a perpetuation of the original sense of burning.

2. In the second class there is a higher degree of inflammation, causing the cutis to exude serum and form vesicles. These in trivial cases dry up and heal; but if the injury to the cutis has been sufficient to cause it to suppurate, they will be succeeded by obstinate ulcers. The pain of these burns is much more severe than in the former class, especially if the vesicles have been torn, and the surface of the true skin exposed to the air and the contact of foreign bodies. The formation and increase of vesicles may often be prevented by proper treatment. They generally appear immediately after the accident, although cases are recorded in which they did not rise for three days.

3. The third class of burns is attended with mortification from disorganization of structure. These are, for obvious reasons, not attended with so much pain as the last class; but in every other respect they are infinitely more serious, and the sores which remain after the separation of the sloughs, are often months or years in healing.

CONSTITUTIONAL SYMPTOMS.—The constitutional symptoms of severe burns are those of great collapse. The surface is pale, the extremities cold, the pulse quick and feeble;—there are violent and repeated shiverings, and the patient often complains most urgently of cold. In some fatal cases these symptoms are soon succeeded by laborious breathing, coma, and death;—in others, dissolution is preceded by a period of imperfect reaction, with delirium, sharp jerking pulse, and the other symptoms indicative of *prostration with excitement.*

PROGNOSIS.—The danger of burns must be estimated by their extent, their severity, their situation, the age and constitution of the patient, and by the symptoms actually present. *Extensive* burns, even of small severity, are always dangerous; and especially if vesication has occurred early, and the cuticle has been stripped off. *Burns on the trunk* are always more dangerous than those of an equal extent on the extremities; and it need not be said that *infancy* and *old age* will be alike unfavourable. With regard to the *symptoms actually present*, it may be noticed, that although the severe pain, such as is common in burns of the second class, is in itself a source of great danger, from its tendency to exhaust the vital powers, still that it is on the whole a favourable symptom, if the injury is extensive; and that the want of it indicates urgent peril. "The early subsidence of complaint," observes Mr. Travers, "unwillingness to be disturbed, apathy approaching to stupor, as if the scale of sensibility had shrunk below the point of pain, is invariably a fatal symptom. Constant shivering is an ill omen. The failure of the pulse and consequent coldness of the extremities, with a livid hue of the transparent skin of the cheeks and lips from congestion in the capillaries, drowsiness, with occasional muscular twitchings, are sure prognostics of death." Subsidence of swelling is an equally ominous symptom.

The *periods of danger* in burns are three; 1st, during the first five days; from collapse or imperfect reaction; 2ndly, during the sympathetic fever which follows, in which the patient may sink with an affection of the head, chest, or abdomen; 3rdly, during the suppurative stage, in which he may die from the profuse discharge, or from pulmonary consumption induced by it. Kentish observes that very many cases prove fatal on the ninth day.

MORBID ANATOMY.—A *post mortem* examination readily accounts for the coma and laborious breathing, which are such constant symptoms of fatal burns. Congestion and serous effusion are found on the surface and in the ventricles of the brain;—and the air cells of the lungs are loaded with a thin muco-serous fluid, as in the "*suffocative catarrh of the dying*" of Laennec. Moreover it has been shown by Mr. Curling,* that severe burns in young people are sometimes followed by an acute ulceration of the duodenum, commencing probably in Brunner's glands, and liable to terminate fatally, by perforating the intestine and causing peritonitis: or by opening some large artery and causing effusion of blood, part of which may be evacuated by vomiting and purging. The cause of these visceral affections is supposed to be the cessation of the exhalent function of the injured portion of skin;—but this explanation merely adds to the obscurity.

TREATMENT.—The treatment of burns in their early stage has been a matter of great dispute. Some eminent surgeons † have advocated ice or other cooling applications; others, the use of turpentine and other stimulants; which latter plan of treatment was ably advocated by Mr. Kentish of Newcastle, at the beginning of the present century.

The following, however, seem to be the *principles* of treatment deducible from the conflicting theories and practices which have been proposed; viz., 1st, that the first applications should be of a mildly stimulating nature; 2ndly, that after the first two or three days they should be soothing; till, 3rdly, slight astringents may be applied to expedite the healing; and 4thly, that the part should throughout be most carefully preserved from the atmospheric air and from cold. If these principles are held in view, the surgeon will have no difficulty in finding appropriate remedies.

Local Treatment of minor cases.—In slight cases of the first and second degrees, the vesications should be pricked with a needle to take off their tension, and the whole burned part be covered with lint soaked in a liniment of equal parts of oil and lime-water, and then be wrapped in soft cotton wool. After the first two days zinc lotion may be applied on lint covered with oil-silk; or a bread-and-milk poultice, or the water-dressing if the part is much inflamed; the chalk ointment may be applied afterwards till the cure is complete. The part should be kept thickly wrapped in cotton wool during the whole period, to preserve it from the air, and from cold or injury.

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* Med. Chir. Trans. vol. xxv.

† Earle's Lectures on Burns, Lond. 1832.

The surgeon, however, may make his choice from a most multifarious list of remedies ; all of which, as Mr. James observes, either possess certain stimulating properties, or else exclude the influence of air and temperature. Thus the burned part may be covered with collodion ; or it may be bathed with tepid oil of turpentine, or alcohol, or æther (which may be warmed by putting them into a teacup, immersed in boiling water), and then should be warmly wrapped up in lint or cotton. But if the surgeon prefer the cooling plan, he may apply any evaporating or refrigerant lotion—cold water is as good as any other: pounded ice mixed with lard was recommended by Earle : a poultice of potato or grated turnip is not to be despised ; but whatever is used, it must be renewed often enough to keep up the sensation of cold.

The liniment composed of equal parts of linseed oil and lime-water, or *Carron oil* (so called because in general use at the iron-works of that name), is a good defensative, but has a most sordid, nauseous odour. *Lime-water and milk* is an analogous preparation. *Soap-liniment* is a good stimulant ; but it is more expensive than turpentine, and not better. *Common thick white paint* has, according to Sir C. Bell,* been used at the Middlesex Hospital ; but, from its containing white lead, its protracted application might be hazardous. *Copaiba* has been employed at the Exeter Hospital, by Mr. Luscombe, and *Treacle* by Mr. Greenhow,† but neither of the last-named applications is to be compared with Kentish's liniment. *Flour*, applied thickly with a common dredger, and *cotton*, very soft and finely carded, are popular applications. They are directed to be laid on the raw surface, and to be perpetually strewed on in thick layers, so as to soak up the discharge ; but without removing any which is already applied. The good effects of these two substances depend on the same principle. They exclude the air, and form a soft covering. But they are apt to become dry, hard, and irritating, and not unfrequently are converted into a noisome mass of putridity and maggots. *Vinegar.*—Mr. David Cleghorn, an Edinburgh brewer, very strongly recommends the application of warm vinegar for the first twelve hours, then poultices till suppuration is established, and chalk afterwards.‡

Of severe cases.—When a burn is severe or extensive enough to cause danger to life, Kentish's plan of first bathing the burnt parts with tepid turpentine, then with all possible expedition applying a liniment, composed of *ung. resinæ* ℥j ; *ol. terebinth.* ℥ss, thickly spread on lint, and lastly, wrapping them up warmly in flannel, seems to be the most judicious. These dressings should be allowed to remain as long as possible, and should not be removed unless there is a profuse discharge or bad smell from the wound. Great care should be taken, when the wound is first examined, not to strip off the cuticle, whilst taking off the patient's clothes.

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* Institutes of Surgery. London, 1838.

† Greenhow, Med. Gaz., Oct. 13 ; and Leach, Med. Gaz., Nov. 3, 1838.

‡ Med. Facts and Obs. vol. ii.

Constitutional Treatment.—If there is an urgent degree of collapse, the measures directed in Part I. chapter I. are to be diligently adopted. Arrowroot, beef-tea, and other forms of mild nutriment, must be judiciously administered, according to circumstances.

Use of Opium.—If there be much pain, a good dose of opium should be given without delay. For children, nothing can be better than the compound tincture of camphor, of which ʒj—ʒij may be given according to the age. (Each fluid drachm contains ¼ of a grain of opium.) Yet it must be added that certain great authorities altogether condemn its employment. "Opium," says Larrey, "is injurious, whether used externally or internally. Externally, it stupifies the parts instead of exciting them to a salutary inflammation; internally, if used in considerable quantity, it enfeebles all the organs, after producing a momentary stimulation."[*] Travers objects to it because of its tendency to produce or increase congestion in the head. He says that "in small doses it is inefficacious, and in large ones injurious." Notwithstanding these objections, however, it may be given in moderation when demanded by urgent pain. If there be a tendency to coma, it is of course inadmissible; but then the patient will most probably perish, whether it be given him or not.

During the sympathetic fever, the bowels must be kept open by some mild laxative, such as castor oil or rhubarb; and the diet must be unirritating, but not too low. In the event of any inflammatory or congestive attack of the head or chest, purgatives, and leeches or bleeding, must be cautiously employed, according to circumstances. If there is any tenderness under the right hypochondrium, or vomiting, or other sign of irritation of the duodenum, the diet should be of the blandest description, and small doses of hyd. c. creta and henbane be administered.

Treatment of the remaining Ulcers.—The ulcers resulting from burns are often extremely intractable. The granulations are pale, flabby, and exuberant; they secrete pus profusely; and many months often elapse before they are healed. The cause of this disinclination to heal is not well understood; but one cause there is which may be easily detected and remedied; namely, too full a diet, which is often needlessly used on the plea of supporting the strength under the profuse discharge. "There can be no doubt," says Kentish, "that full diet and stimulants, during the suppurative stage, keep up irritation in the system, and cause the immense continued discharge by the exposed surfaces of the wounds."[†] And it is equally certain that many cases will rapidly get well when the diet is lowered and purgatives are administered.

There should be no hurry in removing the first dressings, but when they are removed, the succeeding applications must be suited to the state of the ulcer.

[*] Mem. de Chir. Mil., t. i. p. 96.

[†] Second Essay on Burns. Newcastle, 1800, p. 64.

If it is irritable and painful, or hot and swelled, or seems inclined to spread by ulceration, or if small abscesses threaten to form under the skin, poultices, or the water dressing, Dover's powder at bedtime, and aperients, should be resorted to. If sloughs are tardy in separating, the case must be treated like the sloughing ulcer.

When the irritable state is removed, a succession of mild stimulants and astringents will be advisable; especially the zinc lotion; chalk, bismuth, zinc, or calamine ointment; simple lint; and pressure with sheet lead or strips of plaster. When the discharge is very profuse, the sore should be constantly kept thinly covered with very finely powdered chalk. An ointment of carbonate of magnesia has been used with good effect by Mr. Partridge in the King's College Hospital.

Treatment of the Cicatrix.—The cicatrix of severe burns is very liable to become excessively hard, dense, and cartilaginous, and to contract in such a way as to occasion the most serious deformities. Thus the eyelids or mouth may be rendered incapable of closing; the chin may be fixed to the breast, or a limb be rigidly and immovably bent. This contraction may, perhaps, be sometimes successfully opposed, by keeping up extension with a splint, or, if the neck is the part burned, by making the patient wear a stiff collar; and by frequently moving the part during cicatrization; and the cicatrix may be lubricated with pure oil. If the fingers are severely burned, lint should be interposed between them, and they should be kept apart as much as possible, although it will be very difficult to prevent them from adhering together.* In burns of the head or face, the edges of the ulcer may be drawn asunder by strips of adhesive plaster. When any of the orifices of the body are involved they should be kept dilated with canulæ, or plugs of oiled lint. But if, notwithstanding every precaution, the cicatrix contracts, and produces deformity, or prevents any necessary motion, the knife should be resorted to. Sometimes the whole cicatrix may be extirpated, the wound being treated by water-dressing, and the parts kept in a proper position during the cure. Sometimes an incision may be made in the sound skin on each side of the cicatrix, so as to form gaps, which will be filled up with granulations;—sometimes it will be useful to divide it transversely by several incisions, at the same time dissecting it up from the parts beneath if it firmly adheres to them;—if the cicatrix is prominent it may be shaved off, and the wound be touched frequently with lunar caustic;—and, lastly, there is a plan which has been adopted with success by Dr. Mütter an American surgeon, of dividing the cicatrix, dissecting it up where adherent, and even dividing any muscular fibres in order to liberate the parts completely: and then filling up the gap by means of a Taliacotian operation: that is, by transplanting a portion of sound skin from some neighbouring part.†

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* Vide Part IV. chapter xxiv.

† Vide Earle's Lectures on Burns, Lond. 1832; Dupuytren, Clinique Chirurg.; Mütter on Deformities from Burns, in the American Journ. of Med. Sc., July,

CHAPTER VI.

OF THE EFFECTS OF COLD.

EFFECTS OF SEVERE COLD.—When a person is exposed to very severe cold, especially if it be accompanied with wind,—or if it be during the night,—or if he have been exhausted by hunger, watching, and fatigue, he feels almost an irresistible impulse to sleep, which if yielded to, is soon succeeded by coma and death. During the state of coma, the body of the sufferer is found to be very pale and cold: the respiration and pulse almost imperceptible, and the pupils dilated; but the limbs are flexible as long as life remains, unless the degree of cold be very great indeed. On a *post mortem* examination, the chief morbid appearances observed are great venous congestion and serous effusion in the head.

FROST-BITE.—But if the trunk of the body be well protected, the cold may affect only some exposed part, such as the nose, ears, or extremities. The first visible effect is, that the part becomes of a dull red colour;—an effect of cold which is notoriously frequent, and which depends on a diminution of the quantity of blood conveyed by the arteries, and a stagnation of it in the veins. If the cold continue, the venous blood will be gradually expelled by a contraction of the tissues, and the part will become of a livid, tallowy paleness, perfectly insensible and motionless, and much reduced in bulk. When in this condition, a part is said to be *frost-bitten*. The patient may be quite unconscious of the accident that has befallen him until he is told of it by some other person; especially if it be his nose or ear that is affected, or some other part that he does not move.

A frost-bitten part may mortify in two manners;—1st, by *direct sphacelus*, if no reaction whatever is induced; 2ndly, by *gangrenous inflammation;* if reaction, when induced, be rendered too violent.

The degree of cold required to produce frost-bite under any ordinary circumstances of exposure must be considerably below the freezing point. Mr. Guthrie states it at ten degrees below the zero of Fahrenheit.* The natives of warm climates may be severely injured by cold that would be innocuous to the inhabitants of colder regions. Thus, during the siege of Ciudad Rodrigo, when the troops were obliged to sleep on the ground without cover, three of the Portuguese actually died of the cold in one night, whilst the British escaped without being frost-bitten. But very much depends on the temperament; for according to Larrey, the phlegmatic Dutch, Hanoverians, and Prussians, suffered much more during Napoleon's winter campaigns than the darker and more sanguine soldiers of France and

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1842. Several successful cases by Mr. Parker, of Bridgewater, are quoted in Ranking's Half-yearly Abstract, vol. iii. p. 106.

* Guthrie, op. cit. p. 141.

Italy.[*] Those who indulge in spirituous liquors, exhausted as they are by perpetual stimulation, are much more liable to suffer than the temperate.

It was shown by Hunter that the ears of rabbits and combs of cocks may be frozen so as to be quite white and hard and brittle, and yet recover with proper care. And some of the lower orders of animals may be entirely frozen and yet survive. But it is not credible that a whole limb of a human being, much less that the whole body, could be frozen without death ensuing; although stories of such occurrences have long been current amongst authors.[†]

Treatment.—The indications of treatment whenever a part or the whole of the body has been exposed to severe cold, are, 1st, To produce *moderate reaction*, and restore the circulation and sensibility; 2ndly, To *avoid excessive reaction*, which would surely lead to violent and dangerous inflammation.

Of Frost-bite.—The best remedy for a frost-bite is to rub the part well with snow. After a time cold water may be substituted for the snow, and the friction may be rendered brisker. These applications must be made in a room without a fire; and a high, or even a moderate, temperature must be avoided for some time. By these means no other inconvenience will ensue, save slight swelling and tingling, with vesication and desquamation of the cuticle; although the part will remain weak and sensible to cold for some time.

For the *coma induced by cold* the treatment must be similar. At first the body should be rubbed with snow;—afterwards, when its warmth and sensibility are a little restored, it should be wiped quite dry, and be rubbed with fur or flannel. Then the patient should be put into a cold bed in a room without a fire, a stimulant enema should be administered, and a little warm wine and water, very weak, be given as soon as he can swallow. The enema may be composed of water and salt, with a little oil of turpentine; but tobacco, which was formerly recommended by the profession in such cases, and is still popularly considered to be of great service, must not be thought of;—it would surely be prejudicial—perhaps deadly. The after-treatment must be entirely regulated by the state of the patient:—the strength must be supported by mild cordials and nutriment; care being taken not to excite feverishness or headache.

The *contact of any intensely cold body* (such as frozen mercury) causes severe burning pain, followed by vesication. It thus appears that the effects of sudden abstraction may be similar to those of too great communication of heat. The best application is snow gradually permitted to thaw.

VIOLENT GANGRENOUS INFLAMMATION may be caused, if heat is injudiciously applied to frozen or frost-bitten parts. It may also ensue if a part has been exposed for a long period to a *low temperature* which is *suddenly raised*; — although the cold may not have been sufficient to cause actual frost-bite, and may have been tolerated without inconvenience. A good example of this accident is narrated by Baron Larrey,* as it affected the French troops during their campaign in Poland in 1807. During the few days preceding and following the battle of Eylau, the cold was most intense, ranging from ten to fifteen degrees below the zero of Reaumur.† But although the troops were day and night exposed to this inclement weather, and the soldiers of the Imperial Guard, in particular, were nearly motionless for more than twenty-four hours. there were no complaints of its effects. On the night of the 9th of February, however, *a sudden thaw commenced*, and immediately a great number of soldiers presented themselves at the "*ambulances*," complaining of severe numbness, weight, and pricking pain in the feet. On examination, some were found to have slight swelling and redness at the base of the toes and dorsum of the foot; whilst the toes of others had already become black and dry. And in this manner, the toes, and sometimes the whole foot, perished; the mortification being so rapid that it was difficult to say whether it was preceded by inflammation or not—although it probably was so for a very brief period. One case, exactly similar, was treated by Mr. Solly in St. Thomas's Hospital in 1845. The patient, not very temperate, had been employed a whole day in January in handling raw cow hides. In the evening, feeling his left hand excessively cold and stiff, he put it into warm water, and held it to the fire, which excited great pain and inflammation, ending in gangrene, which spread up to the middle of the fore-arm.‡ The best *treatment* for such cases is the application of snow or very cold water, followed by evaporating lotions. These, if employed early enough, may prevent gangrene; or even if that have actually occurred, they should be used as long as it appears to be spreading. Subsequently, stimulating poultices and ointments should be employed to hasten the separation of the sloughs, and to promote granulation.

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[*] Larrey, Mem. de Chir. Mil. tom. iv. p. 111.

[†] See an account of some experiments on the revival of toads after freezing, in the Lond. and Ed. Journ. Med. Sc., Feb. 1843.

CHILBLAINS consist in an atonic inflammation of the skin, induced by sudden alternations of temperature; such as warming the feet and hands by the fire when cold and damp. They may present themselves in three degrees. In the *first*, the skin is red in patches, and slightly swelled; with more or less itching or tingling, or perhaps pain and lameness. In the *second*, there are vesications—the skin around being bluish or purple. In the *third* degree there is ulceration or sloughing.

Chilblains are common in women, children, and weakly persons generally. In persons whose circulation is very languid, they are apt to affect the nose and ears.

Treatment of the First Degree.—The best treatment consists in a combination of local stimulants and depletion. When there is much heat and itching, it is an excellent plan to apply a leech;—or to make punctures with a needle or lancet. It would be impossible to name any stimulant that has not been recommended by the public or the profession. Perhaps the best is that proposed by Mr. Wardrop, and consisting of *six parts of soap liniment, and one of tincture of cantharides*, F. 146. But liniments of mustard, turpentine, camphorated spirit, and ammonia;—friction with snow;—strong brine, or, in fact, any ordinary stimulant, will answer the same purpose. Opiate applications are strongly recommended by Mr. Vincent. Whichever is chosen, it should be used cold, with considerable friction, and should be strong enough to excite some increase of heat and smarting.

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* Mem. de Chir. Mil., tom. iii. p. 61.

† From 20° to 25° below the freezing point of Fahrenheit.

‡ Quoted in South's Chelius, vol. i. p. 128.

If there are *vesications*, care must be taken not to break them; and the liniment must be applied lightly with a feather.

If there are *ulcers* or *sloughs*, and they are attended with much heat, pain, and irritation, poultices are required. But as a general rule, poultices are too relaxing, and stimulating ointments or lotions (such as *ung. resinæ*, *calaminæ*, *zinci*, &c.) should be preferred.

CHAPTER VII.

OF THE EFFECTS OF MINERAL AND VEGETABLE IRRITANTS.

General Observations.—These substances, considered with regard to their local effects, may be divided into two classes. *First*, those which produce inflammation of the animal tissues through their tendency to *decompose* them *chemically*. *Secondly*, those which operate by producing *violent irritation*, but which have no power of causing chemical decomposition.

The *first class* comprehends the strong mineral acids;—the pure alkalis, or their carbonates; sundry metallic salts, such as corrosive sublimate, nitrate of silver, and butter of antimony;—and the concentrated vegetable acids, especially the acetic and oxalic.

The *second class* includes arsenic amongst minerals,—and the whole list of acrid plants, garlic, ranunculus, euphorbium, and the like,—amongst vegetables.

Acids.—The decomposing agency of the concentrated acids appears to depend mainly on their affinity for water. The *sulphuric acid* blackens or *chars* the tissues in destroying them; that is, separates the water and other constituent elements, and sets free the carbon. The *nitric* turns them permanently yellow. The *hydrochloric* leaves a dead white stain. The *hydrofluoric* "is, of all known substances," says Turner, "the most destructive. When a drop of the concentrated acid of the size of a pin's-head, comes in contact with the skin, instantaneous disorganization ensues, and deep ulceration of a malignant character is produced."* *Phosphorus* seems to act both by the heat disengaged in its combustion, and by the acid which is the result of it.

Treatment.—After injury from any of these acids, the first thing to be done is to wash it away, and neutralize it by repeated ablution with warm soap and water, with a little carbonate of soda; then to apply poultices or any simple dressings to the ulcers that remain. The pain of these injuries is greatly increased by cold.

ALKALIS AND CAUSTIC EARTHS.—These, like the acids, appear to destroy animal matter by combining with its water. They also form a soap with the fat. Caustic potass, in the form of *liquor potassæ*, and quick lime, are the substances of this class which most frequently give rise to accidents. The *liquor ammoniæ* produces almost instant vesication and great pain when it touches the skin; it is, therefore, much to be prized as a speedy and efficient counter-irritant.

Treatment.—Ablution with weak warm vinegar and water, followed by poultices and simple dressings.

METALLIC COMPOUNDS.—The *bichloride of mercury* acts by its tendency to combine with albumen; and the *chloride of zinc* and *chloride* (or *butter*) *of antimony* probably produce their cauterant effects in a similar manner. The *nitrate of silver* is remarkable for the superficiality of its effects. It may vesicate the skin, or destroy a film on the surface of a sore, but its action does not spread. It suffers decomposition at the moment of its contact with the animal tissue; its acid appearing to be separated, whilst the metallic oxide combines and forms a white crust with the animal matter: and this soon becomes black, because the silver loses its oxygen, and is reduced to the metallic state.

Treatment.—The bichloride of mercury is rendered inert by white of egg mixed with water;—the chloride of antimony is decomposed by water;—the nitrate of silver by common salt; and the chloride of zinc by a solution of an alkaline carbonate. These, therefore, would respectively be the proper applications for external injuries caused by these metallic compounds; although such cases very rarely come under the surgeon's cognizance.

Arsenic, if locally applied, produces inflammation, or sphacelus, not by any chemical action, but by its influence on the vital properties of the part;—it may also be absorbed into the circulation, and produce its ordinary constitutional effects as well. The *surgical treatment* of any local injury from this mineral must consist in removing it as much as possible by ablution or otherwise, and then applying poultices, or whatever other dressings may be most appropriate. Lime-water might be useful if applied at first. Some cases, almost too horrible to think of, are recorded of the destruction of women by the local application of this poison.

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* Elements of Chemistry, 5th edit. p. 377.

Acrid Vegetables.—The inflammation excited by these substances requires merely soothing fomentations and emollient dressings. The smart from the sting of nettles may, it is said, be allayed by a weak infusion of tobacco, if severe enough to require any remedy at all.

If an irritating fluid have been injected into the cellular tissue, free incisions must be made, both to allow its escape, and to afford exit to pus. By this means sloughing of the skin may often be avoided, although very likely to occur when the subjacent tissue is extensively disorganized.

CHAPTER VIII.

OF THE EFFECTS OF THE POISON OF HEALTHY ANIMALS AND OF THE TREATMENT OF POISONED WOUNDS GENERALLY.

SECTION I.—OF THE EFFECTS OF POISONOUS INSECTS AND SERPENTS.

Insects.—The bites or stings of any insects that are met with in England are not of sufficient importance to need surgical assistance, unless inflicted in extraordinary numbers, or in peculiar situations. Mr. Lawrence[*] mentions the case of a French gentleman who was so severely stung by bees about the upper part of the chest, that he died in fifteen minutes, with all the symptoms of mortal collapse usually produced by the bite of venomous serpents. Children, if much stung by bees or wasps, may suffer severely from headache and fever. But the most common instance of danger from these insects is the alarming suffocation produced when their sting is inflicted in the pharynx or back part of the mouth;—which sometimes happens when they are concealed in fruit, and are incautiously taken into the mouth.

Treatment.—If a person have been stung sufficiently to cause faintness or constitutional depression, cordials and opiates must be administered without delay. Respecting the *local treatment*, the first thing to be done is to examine the parts with a lens, and extract the stings with a fine forceps, if they have been left in the wound, as they very frequently are. Then the best remedies are those which are also most useful in burns, viz., turpentine, vinegar, hartshorn, spirit of wine, eau de cologne, or other stimulants. Cold applications give great relief, if used continuously. Finely-scraped chalk, flour, starch, and oil, are favourite remedies with some people. Mr. James recommends a combination of ung. hydr. fort. and liq. ammoniæ. A weak infusion of tobacco or belladonna might be worth trying. The soap liniment, or compound camphor liniment, may be used to remove the œdematous swelling that remains. The author has been informed by a friend at Sydney, that a poultice of ipecacuanha is there considered to be a specific for almost every kind of venomous bite.

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[*] Lecture Med. Gaz. vol. v. p. 582.

In the case of a *wasp or bee sting in the fauces*, with urgent danger of suffocation, leeches should be plentifully applied both externally and internally;—and hot stimulating gargles (especially hot salt and water) should be frequently used, in the hope of reducing the tumefaction, by causing a copious flow of blood and of saliva : but if these measures fail of affording relief, an opening must be made into the larynx or trachea.

For the bites of bugs, fleas, gnats, mosquitoes, &c., the treatment is the same.

Spiders.—The most celebrated of this class is the tarantula, the miraculous effects imputed to the bite of which are too well known to need repetition here ; and we can feel but little hesitation in subscribing to the opinion of Ray, "that the dancing of the *Tarantati* to certain tunes and instruments, and that these fits continue to recur yearly as long as the tarantula that bites them lives and then cease, are no other than acting fictions, and tricks to get money." We learn, however, from the least romancing of the old writers, that it produces swelling, lividity, and cramps, which were cured by scarifications and wine ; and these are just the symptoms it might be expected to cause, and the most rational cure. The effects of the scorpion are similar. There is one very singular case on record, of a gentleman bitten on the penis by a spider, in America, suffering from violent vomiting, deep-seated abdominal pain, and suffocative spasms in consequence. He was relieved in thirty-six hours, by bleeding, opium, and ammonia.*

Serpents.—The venom of these animals operates, as Fontana observed, by "destroying the irritability of the nerves, and disposing the humours to speedy corruption." The symptoms produced vary in their nature and degree, according to the species of serpent, its degree of vigour, the frequency with which it may have bitten, and the strength of the sufferer. Some serpents can kill only small animals; the poison of some is very virulent, but soon exhausted by frequent biting ; that of others is mild, but not easily exhausted ; some again, act so energetically on the nerves, as to cause death speedily by convulsions ; others produce inflammation of the lungs ; and others, whose venom is insufficient to annihilate the nervous functions at once, kill more slowly by the unhealthy or diffuse inflammation which they excite at the bitten part.

Viper.—This is the only poisonous snake in the British Isles, but it is not often that it kills human beings. The properties of its venom were most painfully investigated, in every possible point of view, by the Abbé Fontana;[*] who ascertained that it is a yellow viscous liquid, not inflammable, and neither acid nor alkaline;—that it contains no salts; and that it has no taste, except perhaps, a slight astringent sensation if it is kept in the mouth for some time. It is not hurtful to another viper, nor does it appear to affect certain cold-blooded animals, as leeches and frogs. Moreover, it is perfectly harmless if applied to any natural mucous or cutaneous surface;—so that large quantities of it have been swallowed with impunity.

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* Ray, Phil. Trans. 1698, vol. xxi. p. 47; Boccone, Museo di Fisica; Hulse, Am. Journ. Med. Sc., May, 1839. Gozzo, Gaz. Med. 1845, quoted in Ranking, vol. ii.

Cobra di Capello.—Dr. Russell found that this was capable of killing a serpent called *Nooni Parogoodo*, but not another cobra; and that its poison was insipid when taken into the mouth, and productive of no ill consequences when applied to the eyes of chickens. The symptoms produced on animals bitten by it are fainting and convulsions, but no swelling; the lungs were stuffed with blood.[†]

Naia Tripudians, hooded snake of Ceylon. Dr. Davy found that its poison tastes acrid, paralyses the iris and levator palpebræ of fowls when applied to their eyes, and is soon exhausted by biting. It acts chiefly on the lungs, which are found gorged with blood and serum; the symptoms being reduction of the animal temperature and prostration of strength. According to the same authority, the *Trigonocephalus hypnale*, or *Carawilla*, has a poison that is mild, but not soon exhausted; that it produces local inflammation chiefly, and can kill frogs, but not large animals.—The *Vipera Elegans*, or *tic polonga*, soon causes death by convulsions; the blood is much coagulated.[‡]

Rattlesnake.—This snake, unlike most others, is capable of poisoning itself. Capt. Hall made one bite itself, and it died in eight minutes. Its effects, according to Sir E. Home, may be divided into two stages, either of which may prove fatal. During the *first*, which may last for sixty-two hours, the symptoms are those of great prostration of the nervous system, and contamination of the blood;—vomiting, deadly coldness, faltering pulse, the skin livid or jaundiced, bleeding from the nose, fainting fits, convulsions, and delirium. Meanwhile the bitten part swells immensely from effusion of acrid serum, and becomes mottled with blood, extravasated under the skin; and this swelling extends to the trunk. Sometimes it is attended with excruciating pain, sometimes with mere numbness or coldness. During the *second stage*, large diffused abscesses form in the swelled parts, which contain bloody unhealthy pus and sloughs of cellular tissue, and are attended with low fever. After death, the body putrefies very rapidly.[§]

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[*] Felix Fontana, Treatise on the Venom of the Viper; translated by Joseph Skinner. 2nd edit. Lond. 1795.

[†] Patrick Russell, M.D., F.R.S. An Account of Indian Serpents. 2 vols. folio. Lond. 1796.

[‡] Davy, Physiological Researches. Lond. 1839.

[§] Sir Everard Home. Phil. Trans. vol. c. Case of T. Soper, who was bitten by a rattlesake. Hall on the Poison of Rattlesnakes, Phil. Trans. vol. xxx. p. 309. Case of Mr. J. Briental, who was bitten by a rattlesnake, reported by himself, Phil. Trans. vol. xliv. p. 147. Case of a man bitten by a rattlesnake to cure lepra, Clarke, Lancet, Dec. 15, 1838.

SECTION II.—TREATMENT OF POISONED WOUNDS.

In the first place, measures must be taken to remove the poison from the wound, or at all events to prevent it from passing into the blood.

If no other means are at hand, a ligature should be tightly applied round the limb, as near as possible to the wound, and between it and the heart—so as to prevent the return of venous blood from it. Then it should be thoroughly sucked, taking care that the person who does so, has no sore nor recent abrasion in his mouth.

A better plan, however, is to cut out the bitten part as freely as may be necessary, and then to suck the wound, and bathe it thoroughly with warm water to encourage bleeding—a ligature being also applied, as in the last case.

But the best plan of all is that recommended by Sir David Barry,[*] who directs, first, that an exhausted cupping-glass shall be applied over the wound for a few minutes;—next, the glass is to be taken off, and the wound freely excised;—and, lastly, the glass is to be applied again in order to promote the flow of blood, and cause the re-exudation of any of the poison that may have found its way into the neighbouring blood-vessels.—The cupping-glass, used in this manner, without interrupting the general circulation of the limb, produces a complete afflux of all the fluids in the vicinity towards the wounded part, and prevents them from conveying their poisoned contents towards the centre of the circulation.

The *treatment of snake bites* during the first stage, consists first in the administration of powerful diffusive stimulants, such as hot brandy and water, ammonia, or the *eau de luce*,[†] to support the nervous system;—and, secondly, in the use of remedies which may be supposed to eliminate the poison from the blood. Thus, if there is no vomiting, it should be excited by a mustard emetic, to get rid of the vast quantity of bile that is often formed in the blood and secreted by the liver under these circumstances; if, however, vomiting is spontaneous and too violent, it should be checked by a large dose of solid opium, and a mustard poultice to the epigastrium. But the principal remedy seems to be *arsenic*, which has long been popular for these accidents in the East Indies. It is usually administered there in the form of a nostrum, called the Tanjore pills, each of which contains a grain of it, combined with certain unknown acrid plants. The efficacy of this mineral was also fully established in the West Indies by Mr. Ireland, surgeon to the 16th regiment, who employed it with perfect success in five cases of the bite of a serpent, which had previously killed several officers and men, some within six hours, and all within twelve.* He combined fʒij of the *liquor arsenicalis* with gtt. x. of tinct. opii (to prevent vomiting), f℥iſs of peppermint water, and f ℥ss. of lime-juice. This draught, which contains a grain of the arsenious acid, was given every half hour for six or eight doses, till it produced copious purging (which was encouraged by clysters), or till the symptoms were ameliorated. The swelled parts were well rubbed with a liniment of olive oil, turpentine, and liquor ammoniæ;—and the patients, although for a time greatly debilitated, were soon able to return to their duty.

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[*] David Barry, M.D. Experimental Researches on the Influence exercised by Atmospheric Pressure, &c. Lond. 1826.

[†] Tinct, ammoniæ comp. P. L. It contains oil of amber. Dose ♏xxx. every half-hour.

Local applications.—The ipecacuanha poultice before spoken of, deserves a trial. Otherwise warm spirituous embrocations appear to be of most service. Very great swelling, or the effusion of semi-purulent fluid beneath fasciæ, may render incisions necessary. *Oil* has been very warmly recommended, both as an internal and external remedy in these cases; and the *fat of the viper*, a strong nauseous substance, is said to be a specific for its bite.†

The *treatment* of the second stage will most likely require a combination of cordials, opiates, and tonics.

SECTION III.—OF INSECTS WHICH BURY THEMSELVES UNDER THE SKIN.

The inhabitants of warm climates are much pestered with insects of various kinds which burrow and propagate under the skin. The most remarkable of these is the

Guinea Worm.—*Dracunculus*, or *Filaria Medinensis*,—a cylindrical threadlike worm, but sometimes as thick as a crowquill, and several feet long. It is endemic in Africa, India, and other hot countries; whence persons often return to England with this pest about them. The worm appears, whilst exceedingly small, to penetrate the skin and effect a lodgement in the cellular tissue, where it remains dormant for some time, and gradually increases in size till it can be felt as a little tumour, or perhaps, as a cord-like ridge under the skin, feeling like a varicose vein. At last, following the rule of other foreign bodies and parasitic growths, it causes inflammation, and a very painful boil forms, which breaks, and allows the animal's head to protrude. Often, at this time, if injured, a considerable quantity of milky fluid exudes from it, which, on examination, is found to be full of small filariæ. If the case is neglected, violent inflammation and abscesses ensue; to prevent which, the animal must be carefully extracted entire. If the head does not protrude, a cut should be made across the track of the animal, which should be gently lifted up, and then a small roll of plaster be put under it, round which it should be carefully wound, day after day, till it is extracted. Extreme cleanliness, and the application of asafœtida, are said to act as preventives.*

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* A Letter to T. Chevalier, Esq. on the effects of arsenic in counteracting the poison of serpents. Med. Chir. Trans. 1813, vol. ii. p. 396.

† Breschet says that the effects of a serpent's bite on birds can be prevented by passing a current of galvanism through the bitten part.

The Chigoe (*Pulex penetrans*), is a minute insect, abundant in the West Indies, which penetrates the skin of the feet, and forms a little cyst beneath it, in which it deposits its eggs. When the cyst is fully formed, it may be of the size of a pea, and is of a bluish colour. The symptoms are a violent itching. The treatment consists in extracting the bag containing the creature and its eggs, which operation is dexterously enough performed by the negroes with the point of a needle, and the cavity left is filled with tobacco ashes. If the bag is broken in the extraction, so that the young chigoes escape, violent inflammation is the result.

CHAPTER IX.

OF THE POISONS CONTAINED IN DEAD HUMAN BODIES, AND OF DISSECTION WOUNDS.

During the decomposition of animal matter, a number of complex substances are liable to be formed, which have a most deleterious effect if introduced into the blood of living animals. These may be called *septic poisons ;* and they appear, according to Liebig, to produce in the living body the same state of decomposition that they are undergoing themselves. These poisons are peculiarly interesting to surgeons, since they are exposed to their influence in the dissecting-room and in performing *post mortem* examinations.

One of the most common of these poisons is a gaseous emanation of a faint, sickly, and indescribably nauseous odour. It is most commonly observed to proceed from the bodies of those who have died of fever, and is so abominably nauseous, and so sedative in its effects, that it often causes sickness and faintness in those who would not be affected by the most advanced putrefaction.

A second class of poisons consists of the compounds of hydrogen, hydrosulphuric acid, carburetted and phosphuretted hydrogen, carbonic acid and ammonia. These gases are abundantly evolved during putrefaction, but although noxious in themselves, can hardly be called *septic*, unless they carry with them some small portion of *decomposing, but not quite decomposed*, animal matter.

The inhalation of either of these varieties of poisonous fumes is liable to induce sickness, dyspepsia, diarrhœa, nauseous taste in the mouth, and other symptoms indicative of the presence of deleterious miasmata in the blood. But these symptoms are generally quickly removed by fresh air, aperients and stimulants.

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* See a paper by M. Maisonneuve in the Lancet for 1845, vol. i. p. 152.

But there is a third kind of poison, met with in the bodies of those who have died of puerperal fever, phlebitis, and other diseases of an erysipelatous character, and capable of producing the most disastrous effects if inoculated into a wound, or even sometimes if applied to the unbroken skin. This, which appears to be identical with the morbid poison, or *materies morbi* of erysipelas, though septic in its nature, is produced during the life of the patient, and is decomposed or dissipated as decomposition advances after death.

The two most important consequences of wounds inoculated with septic poisons are—1. Inflammation of the lymphatics, of which we shall speak elsewhere; and 2. Typhoid fever, with diffuse inflammation of the cellular tissue, which we now proceed to describe.

SYMPTOMS.—The poison having gained admission into the blood through a wound (which is in most cases so slight as to pass unheeded), at a period varying from six to eighteen hours subsequently, the patient feels altogether unwell: he is depressed, faint, and chilly, and complains of lowness of spirits and nausea. These symptoms are soon succeeded by rigors, severe headache, and vomiting;—the pulse is frequent and sharp, but weak;—the tongue is coated, and there is the greatest restlessness and despondency. Then the *first local symptom* appears in the form of a most excruciating pain and tenderness of the shoulder, corresponding to the hand that was wounded. And in most cases there soon afterwards arises a *pustule*, on or near the wound, which sometimes resembles the small-pox pustule, and in other cases is a flattened vesicle, containing a milk-white serum. But this pustule may be unattended with any pain, and the patient may be ignorant of its existence, or may not even be aware that he has received a wound, till his attention is directed to it by his attendants. As the case proceeds, the pain in the shoulder becomes more excruciating, and is attended with fulness of the axilla and neck;—and a doughy swelling appears on the side of the trunk, often extending from the axilla to the ilium. At first it is pale; but it soon assumes an erysipelatous redness, or rather a pinkish tint, like that of peach-blossoms. The breathing now becomes difficult; the pulse quicker and weaker; the tongue dry, brown, and tremulous; the mental distress is truly appalling, although there is seldom delirium; the countenance is haggard, and the skin yellow; and the patient often expires before the local disease has made further progress.

VARIETIES AND COMPLICATIONS.—These symptoms often present considerable varieties in their progress and degree of severity, and may be complicated with other maladies arising from the same, or from some co-existent cause.

1. In one small class of cases, the influence of the morbid poison is so virulent, that the patient actually *dies of the precursory fever*, before sufficient time has elapsed for any local disease to appear—either in

the axilla, or in the wound, or elsewhere. The most speedily fatal case on record, that of Mr. Elcock, was of this variety. He died in forty hours from the receipt of the dissection wound; and the nervous commotion and mental despondency which he suffered were even parallel to those of hydrophobia. Dr. Bell, of Plymouth, died in the same manner.

2. In another (and by far the most numerous) class, the general order of symptoms is the same as we described in the text; that is, there are, at *first*, general depression and fever;—*subsequently*, diffuse cellular inflammation begins in the shoulder and axilla, and spreads down the side of the trunk.

3. In a third class, diffuse cellular abscesses occur in several remote parts—the knee or elbow, for instance, as well as in the axilla as in the case of Mr. Shekelton.*

4. In other cases the wounded finger inflames violently, and suppurates or sloughs;—or the diffuse inflammation begins at the wrist, and extends up the arm.

5. In a fifth class, inflammation of the lymphatic vessels may be combined with the peculiar depressing effects of the absorption of poison; as in the case of Mr. James, narrated in his work on inflammation.

TERMINATION AND CONSEQUENCES.—If the case do not terminate fatally at an early period, extensive and foul collections of matter form in the parts that have swelled;—and abscesses continue to gather under the skin, or between the muscles of the trunk and limbs: and from these the patient may slowly sink;—or, if he survive, his existence may be a mere burden; one or more of the fingers may perish by gangrene, the arm may remain stiff and useless, or the seeds of consumption or dropsy may be left in the system.

In some cases, severe and protracted pains of a rheumatic character have followed the ordinary train of symptoms. Both Sir A. Cooper and Mr. Abernethy suffered in this manner, and the same symptoms have been observed by Mr. Stafford.†

MORBID ANATOMY.—The morbid appearances are those of the various grades of diffuse cellular inflammation. The following may be quoted as a fair description of an advanced stage.‡ The *cuticle* covering the affected side of the trunk, vesicated and wrinkled;—the *cutis* mottled and gangrenous in patches;—the *subcutaneous cellular tissue*, in some parts distended with serum, in others softened and turgid with pus; the *tissue between the muscles* of the trunk, as well as that which separates the different muscular fasciculi, also softened and purulent;—the *muscular fibres*, of a dirty-yellow colour, and softened; — the *axillary glands* enlarged, but not suppurating;—the axillary *artery* and *nerves* healthy; —but the *veins* (especially the smaller branches) dirty red, and softened;—the brachial and median-cephalic veins of the wounded arm, slightly red;—but the fore-arm healthy, and *no connexion whatever to be discovered between the abrasion on the finger and the morbid parts in the axilla;*—the *pleura* of the affected side greatly inflamed; — the lung covered with lymph, and much serum effused into the cavity of the chest.

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* The case of Dr. Bell may be found in Butter on Irritative Fever. Those of Mr. Elcock and Mr. Shekelton are quoted at length (with many others) in Travers on Constitutional Irritation. See also a paper by Mr. Adam, in the Glasgow Medical Journal, August, 1830.

† Med. Chir. Trans. vol. xx. 1836.

‡ Abridged from the case of Mr. Young, in Duncan's paper in the Edinburgh Med. Chir. Trans. vol. i. Quoted also in Travers, op. cit.

Diagnosis.—1. *From acute rheumatism* this disease may be distinguished by the suddenness of its invasion; by the precedence of the constitutional symptoms; by their low typhoid type; by the depression of the pulse; by the pain being confined at first to the axilla; by the characters of the ensuing tumefaction; and by a knowledge of the exciting causes.[*]

2. *From inflammation of the Lymphatics*, which is a very frequent consequence of festering scratches and poisoned wounds, whether received in dissection or not, this more serious affection may be distinguished by noticing, that in inflammation of the lymphatics, the disease *begins at the wounded part*,—which swells and becomes throbbing and painful;—the inflammation extends in red lines up the arm to the lymphatics above the elbow, and in the axilla; and the constitutional symptoms are at first those of *inflammatory* fever, although they may become *irritative* and *typhoid*, if the patient be exhausted by pain, or if matter be confined. Moreover, there are the following broad features of distinction: The constitutional symptoms *precede* the local, in the *diffuse cellular inflammation*; but *follow* them in *inflammation of the lymphatics*. In the *former* disease, the *local affection depends upon the constitutional;* in the *latter* it is the reverse.

Prognosis.—Of the cases on record, nearly two-thirds have proved fatal. The danger will be proportionate to the violence of the constitutional symptoms;—the quickness of pulse, anxiety of mind, and prostration of strength. The cases in which inflammation begins at the injured part are much less dangerous than those in which it appears remote from it, or in several places simultaneously.

Pathology.—Some persons deny that this disease originates in the absorption of poison, and attribute it to mere local irritation acting on an unhealthy constitution.[†] Now it is, on the one hand, perfectly true, that severe diffuse cellular inflammation, or inflammation of the lymphatics, may be produced by the slightest conceivable injury to a vitiated habit. And it is equally certain that most medical students and practitioners are in a bad state of health, and consequently predisposed to suffer from such accidents. But there are reasons which, duly considered, place the existence and agency of a distinct morbid poison beyond all doubt.

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[*] Dr. Law, in a valuable paper in the Dub. Med. Journal, Nov. 1839, gives several cases of glanders and diffuse cellular inflammation mistaken for acute rheumatism.

[†] Abernethy's Lectures, Renshaw's edition, p. 132. Lizars' Practical Surgery, Edinburgh, 1838, p. 71. See the section of *diffused abscesses* in Part II.

1. It is a well-established fact, that *many individuals* are frequently inoculated from *one subject*. This happened in the well-known cases of Professor Dease and Mr. Egan; and numerous other instances of it are on record.*

2. The disease most frequently arises from *fresh subjects*. Mr. Adam, in the excellent paper which we have before quoted from, has collected forty cases;—and in only two or three out of the whole number did the disease arise from a putrid subject. The most dangerous poison seems to be destroyed by putrefaction; and the disease caused by inoculation with putrid matter is in general mild, and consists of mere inflammation of the lymphatics,—although there are exceptions.

3. The *disease of which a subject died* has a manifest influence on the frequency of ill effects from dissecting it. In two-thirds of Mr. Adam's cases the disease affected a serous membrane:—and the most deadly virus of all is contained in the bodies of women who die of puerperal fever.

4. The disease we have been describing *begins* with symptoms of constitutional disorder; and, in fact, *it may be unattended with any local disease whatever*. Consequently it cannot be said to arise from local disease, when there is none.

Lastly, it may be induced by immersion of the fingers in the fluids of a dead body, although the fingers may be quite free from wound or abrasion. A remarkable instance of this is related in the third volume of Tyrrel's edition of Sir A. Cooper's Lectures.†

TREATMENT.—The indications clearly are, to endeavour to eliminate the poison from the blood; to support the nervous system in its state of depression;—and to relieve pain and tension, and promote the discharge of pus or sloughs.

As soon, therefore, as the first symptoms of indisposition make their appearance after a wound received during dissection, it will be advisable that the patient should take an emetic, F. 99, have his feet immersed in hot water, and betake himself to a warm bed. After the vomiting has ceased, he should take ten grains of calomel, followed in two hours by an aperient draught of (F. 33, &c.). These remedies should be repeated, and be aided with turpentine enemata until the bowels are fully unloaded, bearing in mind the experiments of Gaspard and Cruveilhier, in which dogs, into whose veins putrid pus had been injected, recovered on passing black and fetid evacuations.* The thirst must be quenched with lemonade, soda-water, and effervescing draughts ; beef-tea, broth, milk, and other forms of bland nourishment be liberally given ; wine, or brandy, or beer be administered in sufficient quantity to support the pulse ; and opium, to render the patient unconscious of his severe pain. The *muriate of morphia* proved so beneficial in Mr. Stafford's hands, that it is to be preferred in similar cases. It should be given in a full dose (gr.½—j) at bedtime, and in smaller ones during the day ; and if the bowels have first been properly opened, it will most probably allay the pain, calm the restlessness and anxiety, and reduce the frequency, whilst it improves the tone, of the pulse. It may be combined with small doses of calomel, or some other mercurial preparation.

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* Vide Copland's Dict. p. 304; also Nunneley on Erysipelas.

† Travers gives two analogous cases. A Mrs. Clifton died of diffused cellular inflammation following a prick. Two of her attendants became ill from the contact and effluvium of the discharge, although neither had any wound through which a poison might be inoculated. One of them suffered from acute fascial inflammation of the arm; the other from low fever, and abscess in the axilla. The latter was engaged in unfolding some sheets from which a most noisome smell proceeded, when she was all at once seized with sickness and faintness, and excruciating pain in the axilla.—*Constitutional Irritation*, p. 373, 3rd. ed.

Local Treatment.—As soon as pain is first experienced in the axilla, numerous *leeches* should be applied, and their bleeding be encouraged by warm poppy fomentations, or poultices sprinkled with laudanum. But as soon as any distinct swelling can be detected, an *incision* should be made into it,—in order to relieve pain and tension, and to prevent the diffusion of serum or pus that may have been formed in the meshes of the cellular tissue. Incisions are the *sine qua non* of the treatment ; the point on which success mainly depends ; and it is most truly observed by Mr. Stafford, that in most of the cases that have hitherto occurred, if swelling or abscess formed and were not opened, the result was fatal.

If the patient survive, he should as soon as possible be removed into the country, and be put on a course of tonics and liberal diet. All the collections of matter which sometimes continue to form for months should be opened as soon as they are detected ; and the ulcers that remain be dressed with stimulating lotions and bandages.

PRECAUTIONARY MEASURES.—We need scarcely comment on the expediency of using some precautions in performing *post mortem* examinations, especially if the operator be out of health, or if the patient have died of any disease of an erysipelatous character. Scratches on the fingers, and hangnails should be covered with adhesive plaster or collodion, or touched with the nitrate of silver to form an eschar, and the entire hands should be well smeared with lard. If the operator should puncture himself, or should suffer a scratch or abrasion to come in contact with the fluids of the subject, he should immediately wash his hands, and thoroughly suck the wound. Then the nitrate of silver should be applied to it, in order to decompose the poison and excite a slight inflammation, which will impede absorption.

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* Quoted in Ferguson on Puerperal Fever, p. 54.

CHAPTER X.

OF THE EFFECTS OF POISONS GENERATED BY DISEASED ANIMALS.

SECTION I.—OF HYDROPHOBIA.

SYN.—*Lyssa*, *Rabies Contagiosa.*

DEFINITION. — Hydrophobia is a disease caused by inoculation with the saliva of a rabid animal, and characterised by intermitting spasms of the muscles of respiration, together with a peculiar irritability of the body and disturbance of the mind.

SYMPTOMS IN THE DOG.—Since prevention is better than cure, it is very desirable that every medical practitioner should know the symptoms of rabies in the dog, and most especially the earliest symptoms. These, according to Mr. Youatt, are "unusual sullenness, fidgetting, and continual shifting of posture." The dog retreats to his basket or bed for several hours, where he lies curled up, with his face buried between his paws. Then he becomes fidgetty, continually changing his resting-place; appears clouded and suspicious in his countenance, and gazes strangely about him as he lies on his bed. A peculiar delirium is also an early symptom: the dog perhaps springing up and giving an angry bark at some imaginary object. "I have again and again," says Mr. Youatt, "seen the rabid dog start up after a momentary quietude, with unmingled ferocity depicted on his countenance, and plunge with a savage howl to the end of his chain." But if his master speaks to him every fancied object of terror disappears, and he crawls towards him with his usual expression of attachment. Then comes a moment's pause,—a moment of actual vacuity,—"the eye slowly closes, the head droops, and he seems as if his fore-feet would give way and he would fall; but he springs up again, every object of terror once more surrounds him, he gazes wildly around, he snaps, he barks, and he rushes again to the end of his chain to meet his imaginary foe."

The amount of *ferocity* displayed by rabid dogs, varies extremely. Some there are whose fury knows no bounds, and who if loose rush out, biting every man and beast in their way. Others, on the contrary, not only cannot be made to bite, but in the very earliest stage of the disease, show an *increased fondness*, and are perpetually trying to lick their owner's hands and face. Many cases are on record of persons who have been thus infected through some accidental scratch or abrasion, and hence when rabies has been detected in a dog, it is most important to inquire whether any persons have scratches which he may have licked, and if so they should be cauterised at once.

Another early and constant symptom of rabies, is *change of voice.*

Every sound uttered by a rabid dog, says Mr. Youatt, is more or less changed. But there are two sounds in particular that deserve notice; one of which is described as a "hoarse inward bark, with a slight elevation of tone;" and the other a most peculiar and characteristic combination of "a perfect bark, ending abruptly and very singularly in a howl, a fifth, sixth, or eighth higher than the commencement."

Other symptoms, observed at the commencement of the disease, are, loss of appetite, propensity to lick cold surfaces, such as stones or iron; and to devour straws, litter, and similar rubbish; and peculiar eagerness in scenting at and licking not only the common urining places, but corners in rooms that are not usually disgraced by this evacuation. This is considered a highly important symptom. There is no *dread of water* as in the human being; on the contrary, an insatiable thirst, which the dog endeavours to allay by lapping as long as he has power over his jaws. The mouth is dry, and the saliva exceedingly viscid; at first, perhaps, it is slightly increased in quantity, but this increase soon passes off, and the secretion becomes extremely viscid and scanty, sticking to the corners of the mouth, and annoying the poor dog extremely, who may be seen fighting with his paws at the corners of his mouth, as if trying to dislodge some bone which had stuck between his teeth.

Thus, the disease when fully formed, is characterized by delirium, with more or less ferocity, alteration of the voice, great thirst, and viscidity of the saliva, to which may be added perfect insensibility to pain. As it approaches its termination, the eye becomes dull; the hind legs first, and then the muscles of the jaws are paralysed, and at length the poor animal dies exhausted.

But there are some cases in which paralysis of the muscles of the mouth and jaws is a very early symptom; the mouth being open and the tongue protruding. A poor dog in this condition will plunge his muzzle into water up to the very eyes in order that he may get one drop into the back part of his mouth to cool his parched throat. This form of the disease is generally called *dumb madness*. The usual *duration* of the disease is from four to six days.

The *post mortem* appearances show merely the *effects* of the malady, in various degrees of congestion of the mucous membrane of the respiratory and alimentary surfaces. The *tongue*, often torn and bruised, and covered with filth; its papillæ prominent and reddened, the mucous follicles about the frænum enlarged; in the *dumb madness*, the tongue hangs from the mouth, and is swelled and dark-coloured. The fauces show a more or less partial blush, and the epiglottis and larynx are usually much injected. The trachea, bronchi, and lungs are sometimes much congested, sometimes the reverse. The stomach generally shows vivid redness, or sometimes patches of ecchymosis on the summit of its rugæ; the brain, intestines, bladder, and heart display no appreciable or constant morbid signs whatever. Perhaps one of the most characteristic evidences of rabies that dissection affords, is the presence of a peculiarly mingled mass of hay, and hair, and straw, and earth, and excrement in the stomach; or perhaps in the fauces where it may have lodged from defect in the power of deglutition.*

CAUSES.—The cause of this malady in dogs is most frequently a bite from another animal already diseased; yet it must occasionally arise spontaneously. And the most probable sources of its origin are close confinement, rank unwholesome food, want of the *couch grass*, the natural medicine of the dog, and deprivation of sexual intercourse.

Besides the dog, it is probable that hydrophobia arises spontaneously in the wolf, jackall, badger, and perhaps the cat. But it may be communicated to many other mammiferous animals. and there is no doubt but that every animal capable of taking the disease, can also propagate it. This is equally true with regard to human beings as to animals. MM. Magendie and Breschet inoculated two healthy dogs on the 9th of June, 1813, with the saliva of a man who was labouring under the disease, and who died of it the same day at the Hôtel-Dieu. One of the dogs ran away; but the other was affected with decided rabies on the 27th of July following, and died of it;—and some other dogs, which it was made to bite, died also. Well-authenticated cases are recorded, in which the disease was communicated to man by pigs and horses;—and there is no doubt but that it would be so much more frequently, if it were the instinct of herbivorous animals to show their rage by biting. Breschet, in the course of numerous experiments on the subject, repeatedly infected dogs with the saliva of rabid horses and asses. One curious fact demonstrated by these experiments is, that when rabbits, or other rodentia, and birds, are inoculated with the saliva of rabid animals, they very soon die, but without exhibiting any of the ordinary symptoms of hydrophobia.†

In the *horse* the disease commences with great distress and terror, and profuse sweating; he soon becomes frantic and outrageous, stamping, snorting, and kicking.‡ In the *sheep*, the symptoms are similar. An instance is recorded in which eight sheep were bitten, and became rabid; they were exceedingly furious, running and butting at every person and thing, but did not bite. They drank freely.§

There are several points connected with the propagation of hydrophobia, which are still involved in great uncertainty. It is not known whether the saliva is the poisonous agent, or whether some poisonous matter may be secreted by the mouth, fauces, or lungs, and mixed with it. This, however, is not a point of much consequence; but again, it is uncertain whether the whole solids and fluids of the animal are not poisonous also. In fact, there is some reason for believing that the disease may be communicated by the mother's milk.‖

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* Vide *The Dog* by W. Youatt, Lond. 1845.

† Breschet sur quelques Recherches expérimentales sur la Rage. L'Expérience, Oct. 8th, 1840.

‡ Blaine's Outlines of the Veterinary Art. 2nd edit. Lond. 1816.

§ Lancet, 1829—30, vol. ii. p. 511.

‖ Two ewes were bitten by a mad dog, and died hydrophobic. One had two lambs, the other one; all three of which were seized with the disease a week

Moreover, it appears that it may be communicated by contact of the dog's saliva with the skin, or mucous membrane, without any wound or abrasion.* In a case related by Dr. Watson,† the dog's tooth merely indented the skin of the back of the hand, but made no wound. Lastly, a point of more importance and uncertainty than any is, whether the bite of an animal in health, or of one merely enraged, may not cause the disease ;—it is very certain at all events, that the bite of an animal will prove fatal, long before it exhibits any outward symptoms of rabies.

SYMPTOMS IN MAN.—At a variable period after a bite, or after some other mode of inoculation with the saliva of a rabid animal (which period is generally from five weeks to three months, sometimes much longer, possibly even one or two years) the attention of the patient is directed to a peculiar pain of the wounded part, together with slight heat, redness, and swelling. The pain is observed to shoot in the course of the nervous trunks, and has in general a rheumatic character. Sometimes, instead of it, there is a stiffness or numbness, or partial palsy. In some cases it is unattended with redness or swelling ;—in others, on the contrary, the wound has thoroughly inflamed, and has broken out into suppuration afresh, although healed long before. In some instances these premonitory symptoms have not appeared at all,—or have been so slight as to pass unheeded ;—in a few instances they have not appeared till after the accession of the genuine hydrophobic symptoms ;—but in general they are observed from two to five days previously to the actual symptoms of hydrophobia. Of these, the first is a vague feeling of uneasiness and anxiety. The patient finds himself generally unwell ; his mind is irritable, and his countenance gloomy ;—he experiences a succession of chills and flushes, with transient headache ; the appetite fails ; there is frequently vomiting, and sometimes a well-marked accession of fever. Next, the sufferer complains of stiffness of the neck and soreness of the throat, with severe spasmodic pain at the epigastrium, — the respiration also is embarrassed, and frequently interrupted by sighing. But these symptoms are in most cases attributed to cold, and their real nature is not suspected for a day or two, till, all on a sudden, on attempting to drink, the patient is seized with a fit of suffocating spasm, and manifests extreme horror at the sight of fluids.

The most prominent symptoms that henceforth present themselves, are three, viz. difficulty of breathing and swallowing ;—extreme irritability of the body ;—and peculiar disorder of the mind.

(*a.*) The *difficulty of breathing and swallowing* depends on spasm of the muscles of the pharynx and larynx. Sometimes the patient can swallow neither solids nor liquids ; but more frequently the disability extends to liquids only; because they require a greater exertion of

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afterwards, although they had not been bitten by the dog, nor, as was supposed, by the mothers.—Steele, Med. Gaz., Oct. 25th, 1839.

* Hutchinson, Lancet, Dec. 8th, 1838.

† Lectures, Med. Gaz., May 7th, 1841.

those muscles, and are consequently more liable to excite spasms. It is this circumstance that causes the aversion to fluids, and the alarm at the sight of them, which so generally characterise the disease. At first the spasms are excited only by attempts to swallow fluids;—then they are brought on by the sight or thought of them; or by the motions of spontaneous deglutition;—but as the malady advances, they recur in frequent paroxysms,—sometimes spontaneously, sometimes excited by the slightest noise or touch. When the paroxysms have become fully developed, they cause the most frightful struggles for breath. All the muscles are convulsed;—the face is black and turgid, and the eyeballs protrude from their sockets. They may come on either during inspiration or expiration, but more frequently the latter;—the patient struggling most violently to expel the air that is confined in his chest through the closure of the larynx. In this disease, as in tetanus, the fatal termination may ensue from suffocation in the middle of a paroxysm, although it more frequently happens during an interval, from exhaustion.

(*b.*) Next to the spasm, the astonishing *irritability of the surface of the body* is the most prominent symptom of hydrophobia. The slightest impressions on the senses affect the sufferer most intensely. A look, or a sound;—the opening and shutting of the door of his apartment;—the motions of his attendants;—the reflection of light from a mirror;—the least impression on the skin; the touch of a feather, or impulse of the gentlest current of air,—are sufficient to bring on the convulsive fits, and are most earnestly deprecated by the patient.

(*c.*) The *state of mind* is in most cases extremely characteristic. There appears to be a most profound despair;—an utter incapacity for all comfort and consolation;—corresponding with the patient's haggard physiognomy and restless movements, and his hurried desponding tone of voice. He is also in general unusually talkative and verbose, as though he attempted to relieve or hide his sufferings by ceaseless conversation. But in some cases he is possessed with wild maniacal fury, and is obliged to be confined in order to prevent injury to himself or others;—whilst, as a contrary exception, it occasionally happens, that if he be originally of a strong resolute mind, he may preserve his composure throughout, and be to the last endued with sufficient courage to attempt drinking, in spite of the impending horrors of suffocation.

PROGRESS AND TERMINATION.—When the disease is fully established, its torments are aggravated by extreme thirst; and still more by a peculiar viscid secretion from the fauces, the irritation of which brings on the convulsive fits, and causes a perpetual *hawking* and spitting — which are very constant symptoms. Not unfrequently there is vomiting of greenish matter mixed with blood. As the disease advances, the convulsions increase in frequency and violence; there is constant restlessness and tremor;—the lips and cheeks become livid, and perpetually quiver; till at length one fit lasts long enough to exhaust the remaining strength and release the patient from his misery. An entire and remarkable remission (perhaps from the use of medicine) sometimes occurs; and the patient enjoys perfect ease, or perhaps sleeps for some hours;—but yet the symptoms return, after a time, with aggravated violence. Again, in some cases there is a perfect calm before dissolution; "the patient becomes tranquil, and most of his sufferings subside or vanish;—he can eat, nay, drink or converse with facility; and former objects associated with the excruciating torture of attempting to swallow liquids no longer disturb his feelings. From this calm he sinks into repose, and suddenly waking from his sleep, expires."*

MORBID ANATOMY.—The morbid appearances most frequently found are, congestion of the membranes and substance of the brain and spinal cord, with effusion of serum. Sometimes blood is extravasated around the cervical portion of the cord. The lining membrane of the fauces, œsophagus, trachea, and bronchi, are mostly highly vascular; the papillæ at the root of the tongue large; and the lungs congested. The stomach often contains a darkish fluid, and patches of vascularity of a dark purple colour, are found in it and in the intestines. But although some one or more of these morbid appearances are detected in most cases, still there is not one of them that is present invariably. The brain, spinal cord, and fauces have been found pale, and the stomach without spots. Hydrocyanic acid has been detected in the blood after death, but this is not peculiar to hydrophobia.†

PATHOLOGY.—It is quite clear, therefore, that no change of structure that has yet been discovered, can be considered essential to the existence of hydrophobia. It is true that the difficulty of breathing and swallowing may be partially accounted for by the inflammation about the fauces; and that great irritability of the surface is symptomatic of irritation of the spinal cord. But still no mere local changes can explain the mass of symptoms, which must depend on a peculiar change in the blood, or nervous system, or both.

DIAGNOSIS.—The disease which we read of under the title of *spontaneous hydrophobia*, or hydrophobia not caused by a dog's bite, consists sometimes of hysterical symptoms, sometimes of a state like delirium tremens, and sometimes of genuine phrenitis, attended with suffocative dyspnœa and great irritability of the skin. It usually occurs to hysterical women or to drunkards. Now, as we know that hysteria may simulate any disease that can be named, nothing can be more likely than that if an hysterical or nervous person have been bitten by any dog or cat, healthy or otherwise, the fears of the consequences, and knowledge of the symptoms of hydrophobia, will suffice to bring on a simulated attack. Or again, if a person be affected with any form of delirium after an accidental bite, what can be more likely than that hydrophobia will be the leading subject of his ravings?

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* Bardsley, Cycl. Pract. Med. *Art.* Hydrophobia.

† Med. Gaz., 5th September, 1840.

But a correct diagnosis may generally be formed by attentive observation;—by endeavouring to detect the inconsistencies, as it were, that are so frequent in hysteria;—the intervals of perfect complacency and cheerfulness, if the patient can be engaged in conversation, and led to forget his malady;—and by the sudden accession and instant urgency of the false hydrophobia, compared with the more gradual accession of the real. Yet it must be confessed that the diagnosis is by no means always easy. There was a remarkable case at the Middlesex Hospital in the autumn of 1837, which at first so exactly resembled hysteria, and afterwards the delirium of cerebral irritation, or commencing inflammation, that few of the medical attendants could at first persuade themselves that it was real hydrophobia, and even some of those who believed so at first, altered their opinions afterwards. But although there was not much dysphagia, still the *irritability of the skin,—the shrinking and convulsions and catching of the breath induced by the slightest breath of air*, and the *salivation*, enabled Dr. Hawkins to form a correct diagnosis.*

PREVENTIVE TREATMENT.—As soon as possible after the bite of a suspected animal, the whole wound should be excised or cauterized, or both. Mr. Youatt recommends the *nitrate of silver*; and he certainly has a right to speak in favour of it, since he has been bitten many times, and has escaped, though he used no other preventive; and since he gives instances in which out of several animals bitten by the same dog, those who were cauterized by the nitrate of silver escaped all further mischief, whilst some which had the wound excised, or cauterized with a hot iron, were subsequently infected with rabies. These are certainly strong facts in favour of using the nitrate of silver, but cases have occurred in which the immediate and free application of it was useless.

The rule generally given, however, is that the bitten part should be cut out, care being taken to carry the knife wide of the bite. After this, bleeding should be encouraged by the application of a cupping-glass; or the wound should be long and diligently washed in warm water. And then (especially if the bite have been irregular, so that it is uncertain whether the excision has been complete) the raw surface may be cauterized by the nitrate, or by nitric acid, or, as Sir B. Brodie recommends, by passing a probe which has been dipped into caustic potass (melted in an iron spoon) into every nook and corner of the wound.

When we consider that substances introduced fairly into the blood may find their way all over the body in an inconceivably short space of time (probably in nine seconds †) it will be readily seen that excision or cauterization, although performed as soon as possible after the bite, may be of no avail. Yet they *should never be omitted, let the interval be what it may.* And one case is recorded in which it is said, that the patient was saved, although the parts were not cut out till the thirty-first day, and not till the symptoms had actually made their appearance. This, however, is doubtful.*

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* Lond. Med. Gaz., Nov. 4, 1837. Several instructive cases may be found in the Lancet, especially one by Mr. Hodgson, Lancet, 1838—39, p. 582.

† Blake, Edin. Med. and Surg. Journ., Jan. 1840.

Whether the wound, after excision or caustic, should be allowed to heal,—or be kept open, and made to suppurate by irritating ointments, —is a disputed point. The weight of authority certainly favours the latter practice, and beyond the inconvenience it can do no harm.

As for any other preventive treatment, all that can be done is to keep the patient in as good a state of health, and in as good spirits, as possible. But there is not one of the innumerable so-called specifics that is worth a moment's trial. The Tonquin, Ormskirk, and Burling nostrums;—guaco, box, belladonna, and broom tops; all kinds of acids, alkalis, earths, and vegetables; half drowning the patient in the sea; and stewing him in hot air and vapour baths,—all these remedies and plans have in turn been reputed infallible, and found to be good for nothing. At one time it was confidently pretended that certain vesicles appear under the tongue during the premonitory symptoms, and that if these were cauterized, the patient would be safe. But unluckily they can never be found.

CURATIVE TREATMENT.—Here we are met at the outset with the doubt whether hydrophobia can be cured at all; whether, like the plague and small-pox, it will not run its course, without the possibility of checking it. Mr. Youatt says that he believes he has occasionally prevented it in the dog, and that he has occasionally seen a case of spontaneous recovery; but that he has never cured it. Dr. Elliotson believes that the premonitory symptoms may show themselves in men and the disease go no further. But although it cannot be denied that a few rare cases have recovered; still, as the remedies that were supposed to be successful in these cases have been used again and again in others without benefit, the recoveries must fairly be considered accidental and spontaneous.

Bleeding has been frequently tried to a most enormous extent; and one case in the East Indies is said to have been cured by it: but it rarely affords even a temporary alleviation, and rather tends, by exhausting the strength, to accelerate the fatal issue. It may, however, be tried as a *palliative* if the patient is plethoric, and the face becomes very turgid during the spasms.

Warm water.—Magendie and others have proposed, after bleeding, to inject large quantities of warm water into the veins; and it certainly is beneficial, although but for a time.

Opium in different forms has been given most profusely, and certainly with some success;—for whether administered by the mouth, or rubbed into the skin, or injected into the veins, it seldom fails to mitigate the patient's sufferings, although it never averts his death. This was most strikingly exemplified in the case of a prisoner at Milbank, whose case is related by Dr. Burne.† A blister was applied along the spine, and ten grains of the acetate of morphia were sprinkled on the denuded cutis. "Scarcely had one minute elapsed," says Dr. Burne, "when we observed the stare of the eyes and the dreadful alarm and anxiety of the countenance to diminish, then the violence of the spasm to abate, and the catchings in the respiration and the retching to subside; and to our astonishment this general amelioration progressed, till in four minutes the countenance had become placid, and the respiration free; the retching had ceased, and the spasms vanished." This improvement, however, did not last very long;—the symptoms returned,—a repetition of the remedy was powerless,—and the patient died. And this is the general history of the effects of opium.

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* Thompson, Med. Chir. Trans. vol. xiii., and Lancet, Sept. 23, 1837.

† Med. Gaz., April 14, 1838.

The whole tribe of sedatives;—*belladonna*, *digitalis*, *tobacco*, *&c.*, have been repeatedly tried, but with similar results. The *hot air bath* and *cold affusion*,—acids, and alkalis, especially *ammonia*;—every diuretic, purgative, and sudorific that can be thought of, has succeeded no better. In one instance the *liquor plumbi diacetatis* is said to have effected a cure.

In a case which occurred in the King's College Hospital, the suffocative spasms were entirely relieved by letting the patient eat large quantities of ice, and applying it externally to the spine and throat;* and the last thing that has been tried is the resin of Indian hemp; but a brief respite from suffering is the utmost good they produce.

Mr. Hewitt, surgeon in the Bombay Medical Establishment, has related a single case in which the patient was saved by violent salivation. Several native soldiers and other persons were bitten one night by a wild jackal, which when killed was found to be very feeble and apparently starved, and its liver rotten and full of abscesses. A month afterwards two of the persons that had been bitten were found dead in the fields, and, from the description which was given of their symptoms, Mr. Hewitt judged that they had perished of hydrophobia. Shortly afterwards, three others were seized with the disease, and came under his treatment. He induced salivation in one of them (a woman) by the most profuse administration of mercury, and she recovered; but with the other two, who were men, the same remedy was of no avail. Strangely enough, the natives of these parts were entirely ignorant that such a disease as hydrophobia existed;—a sufficient refutation of the perverse error of those who maintain that it is entirely an imaginary affection brought on by fright.†

In the present state of our knowledge, the principal object in the treatment of this disease is to allay the patient's sufferings. This should be done by keeping the patient perfectly quiet and in the dark; and by the administration of opium, chloroform, Indian hemp, and other sedatives and narcotics. The strength should be kept up with whatever nutriment can be taken. And if the surgeon imagines that he can give any other remedy with a chance of benefit, and without adding to his patient's sufferings, let him do so.

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* The case is related by Dr. Guy in his edition of Hooper's Physician's Vade Mecum, p. 277.

† Account of the effects of the bite of a wild jackal in a rabid state, as the same occurred at Kattywar, in the East Indies, in 1822. Med. Chir. Trans. vol. xiii. 1825.

SECTION II.—OF THE GLANDERS.

SYN.—*Equinia.* Elliotson.

DEFINITION.—The glanders is a disease of the horse tribe, communicable to man and other animals. It is chiefly manifested by unhealthy suppuration of the mucous membrane of the nasal cavities, pustular eruptions on the skin, and unhealthy abscesses in the lymphatic system.

SYMPTOMS IN THE HORSE.—It may occur in two forms, which, however, are merely manifestations of the same disease in different parts. When seated in the *lymphatic system*, it is called *farcy*—when in the *nasal cavities*, *glanders*. But these two forms are essentially identical; the pus of either of them will reproduce the other; and farcy always terminates in glanders, if the animal live long enough, and its progress is not arrested.

Farcy begins with hard, cord-like swellings of the lymphatic vessels and glands, called *farcy-buds*. These slowly suppurate, and form unhealthy fistulous sores, which discharge a copious thin sanious matter.

If suffered to proceed unchecked, farcy leads to glanders, although more frequently the latter arises first.

Glanders.—Its symptoms are, a *continued* flow of discharge from one or both the nostrils (generally the left), which discharge is at first thin and serous; then thick and glairy, like the white of egg; but after a time becomes opake, purulent, bloody, and horribly offensive, retaining, however, its viscidity. Soon after it commences, an enlarged gland may be felt under the lower jaw adhering to the bone. The next things noticed are one or more ulcers on the Schneiderian membrane, having the sharp edges and scooped out character of chancre; these spread widely and deeply, and lead to caries of the bone. Then the lips and eyelids swell, and the conjunctivæ suppurate; and the external parts of the face may become gangrenous, and the animal may die in a few days with putrid fever;—or he may perish more slowly:—the disease spreading to the lungs, and death being induced by cough, emaciation, hectic, and the formation of unhealthy abscesses in the lungs and all over the body. The *distinctive symptoms*, according to Youatt, are the *continuousness* of the discharge, and the adherence of the enlarged submaxillary gland.*

SYMPTOMS IN MAN.—This disease may appear either as glanders or farcy; either of which may be acute or chronic.

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* Blaine, op. cit.; Youatt on the Horse.

(1.) The *acute glanders* begins with all the symptoms that indicate the absorption of a putrid poison. There are general feelings of indisposition, lowness of spirits, and wandering pains; followed by fever, furred tongue, great thirst, profuse perspirations at night, great pain in the head, back, and limbs, and tightness of the chest. After some days these symptoms increase; there are severe rigors and delirium, often of a phrenitic character; the perspirations become more profuse, and sour and offensive, and are attended with diarrhœa of a similar character. Then *diffused abscesses* appear in the form of red swellings about the joints, especially the knees and elbows—the patient complains of heat and soreness in the throat; the tongue becomes dry and brown, the respiration more oppressed, and the fever assumes a decidedly low malignant character. Next (perhaps a fortnight from the commencement of the illness, sooner or later in different cases) a dusky shining swelling appears on the face, especially on one side, extends over the scalp, and closes the eyes. Then the characteristic features of the disease appear;—an offensive, viscid, yellowish discharge, streaked with blood, issues from the nostrils; and a crop of large and remarkably hard pustules (compared by some to those of the small-pox, and said by others to be about the size of a pea) appears on the face. In the meanwhile the swelling and inflammation increase;—a portion of the nose or eyelids mortifies;—the discharge becomes more and more profuse and offensive;—the pustules spread, and extend over the neck and body; fresh abscesses form and suppurate; the thirst is most excruciating; and low murmuring delirium and tremors usher in death, much to be wished for.

(2.) The *chronic glanders* is characterized by a viscid and peculiarly fœtid discharge from one nostril, with pain and swelling of the nose and eyes;—and emaciation, profuse perspiration, and abscesses near the joints, from which the patient slowly sinks.

(3.) In the *acute farcy*, the patient receives the poison through a wound or abrasion, which inflames violently, together with the lymphatics leading from it. The symptoms are attended with considerable fever, and are generally soon followed by the diffused abscesses, pustular eruption, and nasal discharge, that characterize acute glanders.

(4.) In the *chronic farcy*, a wound poisoned by glanderous matter degenerates into a foul ulcer; the lymphatic vessels and glands swell and suppurate; abscesses form in different parts of the body; and if the disease is not cured, or does not destroy the patient first, it terminates in acute glanders.*

CAUSES.—In the horse this disease may, without doubt, arise spontaneously, when the animal is subjected to the usual influences that generate putrid poisons;—namely, insufficient and unwholesome food, close confinement, and ill ventilation, especially on board ship.

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* Case of Mr. Turner, Travers, Constitutional Irritation, p. 399; Case of Farcy ending in Acute Glanders in seven months, L'Expérience, Jan. 1839.

Mr. Youatt believes that it may arise if the animal is kept in a poor state of health, as the climax of constitutional weakness and derangement. In man, it is generally produced through inoculation of the matter into a wound. Whether it can be contracted by *infection* through the miasmata arising from it, without actual *contact* of the matter, is not yet quite decided. There are, however, some grounds for believing that this disease (like others of a similar character) is occasionally propagated by infection in the horse; and that the effluvia are capable of communicating some form of malignant fever, although not true glanders, to the human subject. But the matter from the abscesses or nasal cavities of human beings is capable of communicating the disease both to men and animals. A man died of glanders in St. Bartholomew's Hospital, in 1840, and the nurse who attended him inoculated her hand, and died of it also in a very few days; and two kittens which were inoculated from the nurse, became affected likewise. Moreover the blood of a glandered horse injected into the veins of a healthy one communicated the disease, although no abnormal appearance could be detected in it by the microscope.* The time at which the disease appears after inoculation varies from three days to a month.

PROGNOSIS.—This, in the acute disease, is highly unfavourable; the chronic, however, is sometimes, although rarely, recovered from.

MORBID ANATOMY.—The morbid appearances are the same both in man and in the horse. Clusters of white granules, or tubercles, or, as Dr. Craigie describes it, of matter like putty or thick pus, are found in whatever tissues the disease has invaded; in the Schneiderian membrane, in the antrum and frontal sinuses, and in the vicinity of the different abscesses. The nasal cavities mostly contain a thick brown gelatinous secretion, and are studded with foul gangrenous ulcers, from which project fungous clusters of tubercular matter.

PATHOLOGY.—The *proximate cause* of the acute glanders appears to be a contamination of the blood with the poisonous matter. This is evident from the early depression of strength and spirits, from the profuse and fœtid perspirations and purgings, from the consecutive or simultaneous appearance of the local suppurations, with their peculiarly offensive and characteristic discharge, as well as from the black and thin condition of the blood, which has lost the faculty of coagulation. —In the chronic forms, the disease, like Mr. Blackadder's cases of hospital gangrene, or like primary syphilis, appears to be at first local; the constitution is affected subsequently.

TREATMENT.—The chief points to be attended to in the treatment of glanders are, to open all abscesses as soon as they form; to syringe the nasal cavities with solutions of creosote; and to support the strength and abate the thirst with wine and soda water. Injections of creosote have cured both the acute and chronic glanders; but almost any other treatment that can be named has been found of no service. Depletion is inadmissible. The effluvia must be counteracted by fumigations of chlorine and aromatics. In the treatment of farcy likewise, the chief points are to open all abscesses early, and support the strength. Any swollen glands should be extirpated.*

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* Reynault, quoted in Provincial Medical Journal, 18th Feb. 1843, from the Report of the French Academy for Feb. 2, 1843.

CHAPTER XI.

OF THE VENEREAL DISEASE.

SECTION I.—OF ITS GENERAL HISTORY AND PATHOLOGY.

DEFINITION.—The venereal disease, using the term in its widest acceptation, consists in the effects of certain morbid poisons, generated and usually communicated by promiscuous sexual intercourse.

It includes two distinct diseases, *gonorrhœa* and *syphilis*, which differ widely in their nature and effects.

Both diseases present two classes of symptoms; the *primary* and the *secondary*;—the primary being the effects of the morbid poison on the parts to which it is actually applied; the secondary being the subsequent results of some general disorder of the constitution.

GONORRHŒA is an inflammation of the mucous membrane of the genitals, which is occasionally, though not very often, succeeded by various rheumatic affections, as secondary symptoms.

SYPHILIS consists, first, of ulceration of the parts to which the morbid poison is applied, and inflammation of the neighbouring lymphatics, which are the primary symptoms; and, secondly, of sundry eruptions of the skin, ulcerations of the throat, inflammations of the eyes, and inflammation and caries of the bones and joints, which are the secondary symptoms.

The primary symptoms of syphilis are undoubtedly contagious, and communicable by inoculation with the matter from the ulcers. The secondary symptoms, which depend on a general contamination of the constitution, are not communicable by inoculation; but they are capable of transmission from a mother to the fœtus in utero, and it is probable that they may also be communicated from the husband to his wife, from a nurse to a suckling infant, and from an infant to its nurse.

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* Vide Elliotson's papers in the Med. Chir. Trans. vols. xiii. xviii. (*with a coloured plate*) and xix.; the Med. Gaz., vol. xix. p. 939; case communicated from father to son, Lancet for 1831-32, vol. i. p. 698; Rayer, de la morve et du farcin chez l'homme; Mém. de l'Acad. de Méd. 1837; the cases of the patient and nurse in St. Bartholomew's Hospital above quoted. in the Lond. Med. Gaz., April 18th and 25th, 1840; case of acute glanders cured by injections of creosote by Mr. Ions, Lancet, April 30th, 1839; case of acute farcy cured by iodide of potassium with iodine, Arch. Gén. de Méd., Jan. 1843; a case similarly treated by Mr. Curtis of Camden Town, and reported in Youatt's book on the Horse, 1845; and an excellent chapter on glanders, embodying almost all that is known of the disease, with an interesting historical sketch of the progress of knowledge on the subject. in Dr. Burgess' Translation of Cazenave on Diseases of the Skin, Lond. 1842. See also a case of acute farcy by Dr. Craigie, Edin. Med. and Surg. Jour., Jan. 1843. Many valuable cases may be found in the Irish Medical Journals. as the disease is far more prevalent in the sister kingdom than it is in England.

There is, moreover, a third class of symptoms, which may be called *tertiary;* consisting of various eruptions, rheumatic pains, falling off of the hair, deafness, and all kinds of anomalous cachectic complaints, which are the sequelæ of syphilis when it operates on an originally bad constitution, or is aggravated by ill-treatment. This vitiated state of constitution is doubtless a frequent source of stunted, sickly, and scrofulous children.

We must next lay before the reader as brief an account as possible of the various disputed opinions with regard to the history and origin of this disease.

The following are the principal questions in dispute; — namely, *First,* Was the venereal disease known to the ancients? *Secondly,* Was it imported from America? *Thirdly,* Are there more syphilitic poisons than one? *Fourthly,* Are the poisons which produce *gonorrhœa* and *syphilis* identical? *Fifthly,* What is the origin of syphilis? And, *lastly,* what are the specific virtues of mercury?—These questions we will discuss *seriatim.*

I. WAS THE VENEREAL DISEASE KNOWN TO THE ANCIENTS?—(*a*) *Arguments in favour of its antiquity.*—They who believe that it was known to the ancients argue thus: They affirm that writers on medicine from the earliest ages make mention of sundry ulcerous diseases of the genitals and the fauces, some of which were most probably venereal. That, in particular, some of the ulcers of the genitals mentioned by Celsus correspond exactly with certain ordinary venereal sores of the present time.* That Rhazes, an Arabian writer, mentions an ulcer of the penis produced by the "*accensionem mulieris supra virum.*" That sundry foreign authors who flourished between 1270 and 1470, mention ulcers and pustules of the penis as contracted *by lying with foul women;* or with women who have ulcers,—or who have lately had connection with one whose penis was ulcerated. But the strongest arguments of all are contained in two papers presented by Mr. Beckett to the Royal Society in 1717 and 1718, in which he contends for the antiquity of the disease in England. He proves that gonorrhœa was well known in 1162 under the terms *brenning* or *burning;*—and that certain enactments were extant, which provided that any *stewholder* keeping a woman with the *perilous infirmity of burning* should forfeit the sum of one hundred shillings. Further, he says, that John Arden, surgeon to Richard II. (1380), defines the *brenning* to be an *inward heat and excoriation of the urethra;* and that, besides, he mentions certain "*contumacious ulcers*, which we now term *chancres.*"

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* De Medicinâ, lib. vi. cap. 18.

Another potent line of reasoning is founded on the circumstance, that many ancient authors state the *leprosy* of their times as being *contagious*;—and that *ulcers of the penis* and *heat of urine* were contracted by men who lay with leprous women. But it is reasonable to infer, that what they called *leprosy* was in reality *venereal disease*. Because, in the *first* place (as Bateman says), "there is little doubt that every species of cachectic disease accompanied with ulceration, gangrene, or any superficial derangement, was formerly termed leprous;"*—and because, in the *second* place, there is no ground for believing that *elephantiasis* (the real tubercular leprosy) is contagious at all;—and because that disease is never communicated by contact in modern times, whether in carnal conversation or otherwise;—a fact which has been ascertained by ample experience, especially at Madeira.† Mr. Beckett further mentions the occurrence of *nodes on the bones* at those early periods; and shows that some of the so-called leprous diseases were cured by mercury, whilst real leprosy is not. Therefore they who believe in the antiquity of the venereal disease contend, that discharges from the urethra and syphilitic ulcers on the genitals were known in the earlier ages; and that they were known to proceed from fornication; although the secondary symptoms which followed them, were for the most part not known to be venereal, but were (like most other chronic skin-diseases) confounded with the leprosy. We may further remark that syphilis appears to have been known from time immemorial in China.

(*b*) *Arguments against its antiquity.*—On the other hand, the opponents of its antiquity contend, that although ulcers or pustules on the genital organs and sundry discharges were not unknown; still that neither in Celsus, nor in any other ancient writer, do we find mention that such maladies were *solely, or even frequently, the produce of sexual commerce*; or that they were peculiarly *difficult to heal*; or that they were frequently, or indeed ever, *followed by constitutional diseases.* But the most potent argument of all is this;—namely, that all at once, whilst the French army, between the years 1494 and 1496, under Charles VIII., was besieging Naples, a new and terrible disease sprang up, rebellious to every known method of treatment; attacking high and low, rich and poor; sparing neither *age* nor sex; consisting of ulcers on the parts of generation in both sexes, which were speedily followed by affections of the throat and nose; by corroding ulcers over the whole body; by excruciating nocturnal pains, and frequently by death. Whereas "not one word that can be construed into any similar affection, is to be met with distinctly stated in any writer before that period."

They, therefore, who are in favour of its antiquity, must hold one of these three opinions concerning that virulent disease of the fifteenth century:—viz. 1st, that it was a *new kind* of venereal disease;—or,

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* Bateman on Cutaneous Diseases, 5th ed. pp. 304 *et seq.*

† Mr. Bacot and others who oppose the antiquity of the venereal disease, assert that leprosy is "*undoubtedly contagious.*"

2ndly, that it was merely an *aggravated variety* of the old disease; or, 3rdly, that it was *not the venereal disease* at all; but some malady (such as *sivvens*, *yaws*, *radesyge*, *&c.*) resembling it.

The most probable supposition is, that syphilis did exist from very early ages, but that it received increased virulence in the fifteenth century in consequence of war, famine, and the intercourse of foreigners; circumstances, which in all times have produced an aggravated type of syphilis; whilst its virulence is invariably diminished under the influence of peace and cleanliness. But the consideration of the history of this new malady brings us to our second question.

II. WAS IT IMPORTED FROM AMERICA?—The greatest weight of evidence is certainly opposed to this supposition; because no such disease is mentioned by the *very earliest* historians of the discovery of that continent;—neither is it mentioned by the earliest writers on America; and Peter Martyr, who was physician to Ferdinand and Isabella, and who was actually at Barcelona when Columbus returned from his first voyage in 1493, does not say a word as to its American origin. But besides—of the earliest authors on the venereal disease, some attribute it to the *divine vengeance*, some to an *earthquake*, some to a *malignity of the air* caused by an overflow of the Tiber; not a few to a *celestial influx*, or *malignant conjunction* of *Saturn and Mars in the sign of Scorpio*, or some other astrological nonsense;—almost all refer its outbreak to the siege of Naples—but not one for the first thirty or forty years derives it from the West Indies. And it appears pretty certain that the disease prevalent in the West Indies, which might have been brought home, was not syphilis, but the *epian*, or *yaws*, or *sivvens;* a disease often communicated to the *very young* or *old*, and to persons who do not catch it by carnal conversation.

III.—ARE THERE MORE SYPHILITIC POISONS THAN ONE?—Carmichael and others assert, that there are various kinds of syphilitic poisons, each kind causing a peculiar primary ulcer, and a peculiar train of secondary symptoms. They say, in proof of their opinions, that every other morbid poison is *uniform and regular* in its effects; and that it would be "an unreasonable and unwarranted exception to an universal law of nature," if the venereal were not so also. But venereal diseases are *multiform* and *irregular*, consequently they must be caused by more poisons than one. For what other single poison can produce papular, pustular, scaly, and other kinds of eruptions?

But these arguments are subverted by the fact, that a prostitute with one ulcer, may cause various kinds of primary ulcers in the men who have intercourse with her;—that the same kind of primary sore will give rise to different eruptions in different persons, and in the same person at different times;—that the differences of primary sores depend on differences of situation, constitution, treatment, and the circumstances of the times, as was observed above:—and that if arguments in favour of multiplicity of poisons be drawn from the mere appearance of ulcers or eruptions, there may be forty or fifty instead of four or five venereal poisons.*

IV. ARE THE POISONS OF GONORRHŒA AND SYPHILIS IDENTICAL?—Hunter believed that they were identical, for he produced a chancre by inoculation with gonorrhœal matter, which was followed in three months by sore throat and eruptions. But the recent researches of Ricord show, that, although the pus of a syphilitic ulcer, like any other morbid secretion, may irritate a mucous membrane and produce gonorrhœa, still that gonorrhœal matter will not produce (at the present day) primary syphilitic ulcers, and that gonorrhœa will not be followed by secondary syphilitic symptoms, unless there is also a chancre or syphilitic sore in the urethra; which was probably the case with the patient from whom Hunter took the gonorrhœal matter.

V. WHAT IS THE ORIGIN OF SYPHILIS?—M. Ricord throws out the conjecture, that a source foreign to the human race may have furnished the first germ of syphilis, which, once engrafted, has been propagated by inoculation like the vaccine virus; and he believes that it never arises spontaneously. Another opinion is, that it may occasionally be produced *de novo*, if a mixture of various foul and diseased male and female secretions act upon a breach of surface in an unhealthy constitution. "I believe with my friend Mr. Guthrie," says the late eminent army-surgeon, W. Fergusson, "that wherever prostitution is foul and unclean, restricted to few women amongst crowds of men, there the infection will be generated; which afterwards spreads through society at large. The irregularities of man are at all times punished by the generation of diseases, and loss of the health; and it would be difficult to believe in a superintending providence if this transgression of divine and human law should be allowed to pass unpunished."† This quotation seems to contain the most common sense view of the question. And the following facts furnish a kind of approximation to a proof of it. Seventeen galley-slaves were inoculated with gonorrhœal matter. Slight ulcers were produced, which in five of the cases healed readily enough. But the remaining twelve patients were either scrofulous or scorbutic, or in an ill state of health, and seven of these suffered from eruptions and wandering pains.‡ Of the causes of gonorrhœa we shall speak in the next section.

Lastly, IS MERCURY A SPECIFIC?—Hunter not only considered that no really syphilitic disease could get well without it, but gravely upbraids human nature for doubting it. "Nothing," says he, "can show more the ungrateful and unsettled mind of man than his treatment of this medicine. If there is such a thing as a specific, mercury is one for the venereal disease." The following results, however, of experiments made by the army surgeons, and especially by Rose,

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* Carmichael enumerates *five;* Judd *nine;* which, however, he does not believe to be all that exist.

† Notes and Recollections of a Professional Life, by the late W. Fergusson, M.D., Lond. 1846.

‡ P. H. Hernandez, quoted by Ricord.

Guthrie, and Hennen, will enable the reader to form a juster estimate of its capabilities. It is concluded, (1) That all kinds of primary and secondary symptoms *may* get well without mercury. (2) That out of 1,940 cases treated without it, ninety-six had secondary symptoms; and out of 2,827 treated with it, fifty-one had secondary symptoms. The average result of different experimenters, however, show that there are at least *seven times* as many cases of secondary symptoms, when no mercury has been given, as when it has. (3) That the secondary symptoms of cases treated without it are in general less severe, and that affections of the bones in particular are much less frequent. (4) That the average period of cure is much the same in both cases; but that relapses are more frequent when no mercury has been given.*

SECTION II.—OF GONORRHŒA.

SYN.—*Gonorrhœa virulenta ; Blenorrhagia ; Urethritis.*

DEFINITION.—A gonorrhœa signifies a discharge from the mucous membrane of the male or female genitals; generally produced by contagion from a similar discharge during sexual connexion.

SYMPTOMS.—These may be conveniently divided into three stages. In the *first stage*, the patient merely notices a little itching at the orifice of the urethra, with a slight serous, or thin whitish discharge. If the disease is not checked at once, it passes after a few days into the *second*, or acutely inflammatory stage. The discharge becomes thick and purulent, and when the disease is at its height is greenish, or tinged with blood. The penis swells; the glans becomes of a peculiarly cherry colour, is intensely tender, and often excoriated. In consequence of the tumefied state of the urethra, the stream of urine is small and forked, and passed with much straining and severe pain and scalding. All the parts in the vicinity of the genitals, the groin, thighs, perinæum, and testicles, ache and feel tender; and the patient's nightly rest is disturbed by long-continued and painful erections, and by *chordee*, that is, a highly painful and crooked state of the penis during erection. This arises from a deposit of lymph in the *corpus spongiosum urethræ*, which glues together the cells, and prevents their distension, so that when the penis is turgid with blood, it is bent at one part, and horribly painful.

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* Vide Astruc on the Venereal Disease, Lond. 1754; Aphrodisiacus, by Daniel Turner, M.D., Lond. 1736 (a collection of the opinions of the early authors); Hunter on the Venereal; Hennen's Military Surgery; Carmichael on Syphilis; Bacot's Treatise on Syphilis; Travers on the Venereal; Titley on Diseases of the Genitals of the Male; Wallace on the Venereal (Plates); Judd's Treatise on Urethritis and Syphilis (Plates); H. J. Johnson, in Med. Chir. Review; Colles on the Venereal; Ricord, Traité des Maladies Vénériennes, Paris, 1839; Mayo on Syphilis, Lond. 1840; Mr. Lane's Lectures in the Lancet, 1841 and 1842; Mr. Acton's Treatise on Venereal Diseases, with an Atlas of Plates, Lond. 1841.

Besides the above symptoms, the following complications may occur in various cases:—

1. There may be severe *irritation* or actual *inflammation of the urinary organs*;—sometimes of the deeper portion of the urethra, producing great pain in the perinæum, and spasm of the accelerators and other muscles during micturition, so as to interrupt the stream of urine, and cause the most exquisite agony, or even sometimes complete retention;—sometimes of the bladder, causing a very frequent desire to make water, and great pain in doing so, which lasts for some time afterwards, together with a white mucous cloud in the urine;—or there may be pain in the loins, scanty urine, tenderness of the abdomen, vomiting, and other signs of severe irritation of the kidneys.

2. *Hæmorrhage* from the urethra;—from rupture of the distended capillaries during violent erection. The loss of blood generally gives relief.

3. Inflammation and obstruction of the *mucous follicles* of the urethra, which may suppurate and burst either in the urethra, or externally; or both.

4. *Inflammation* of the *lymphatic glands* of the groin; constituting *sympathetic bubo.*

5. *Gonrrohœa spuria, vel externa*, or *balanitis* (βάλανος, *glans*)—inflammation and suppuration of the mucous investment of the glans and prepuce, and of the sebaceous follicles around the *corona glandis.* This affection will be treated of in the section on the Diagnosis of Chancre.

6. *Phymosis*, or *paraphymosis*, may easily arise, owing to the swelled condition of the *glans* and prepuce. When the latter is œdematous, it presents a curious semi-transparent appearance called *crystalline.*

7. Inflammation of either testicle.

8. *Gonorrhœal rheumatism*;—pain, swelling, and tenderness of the joints, especially of the knees and ankles, and fever; this generally occurs towards the decline of the complaint, and attacks young people of a delicate strumous habit. The same persons are also liable to rheumatic ophthalmia, or inflammation of the fibrous structures of the eye; but this, which is a sympathetic affection, must not be confounded with the gonorrhœal inflammation of the conjunctiva, which is caused by the contact of the discharge. Bacot says, that the rheumatism is sometimes suddenly relieved by the appearance of patches of minute papulæ or pustules.

In the *third stage*, the inflammatory symptoms and chordee abate, and a muco-purulent discharge is left, which, when obstinate and thin, is called a *gleet.*

VARIETIES.—Gonorrhœa varies extremely in its severity. It is always most severe in first cases, and in patients who are very young, or who possess irritable or scrofulous constitutions. In such cases it may be attended with extreme fever and constitutional disturbance, and may even prove dangerous to life by leading to extensive abscesses in the neighbourhood of the bladder.*

But, after repeated attacks, the urethra becomes as it were inured to the disease, and each subsequent infection is generally (although not always) attended with fewer of the symptoms of acute inflammation. In some instances, the constitutional affection is extremely anomalous, and characterized by severe and continuous rigors.

Gonorrhœa sicca.—There is one form of gonorrhœa which is occasionally met with in the male, and Mr. Acton has often met with it in the female, in which the mucous membrane is red, swollen, and tender, but free from discharge. In the male, there are severe scalding and pain in making water, with painful erections, and the lips of the urethra are red and swelled. This form of disease has the popular name of the *dry clap.*

MORBID APPEARANCES.—On dissecting a urethra affected with recent gonorrhœa, the mucous membrane is found red and swollen, and the follicles or *lacunæ* enlarged and filled with pus, especially the large lacuna in the fossa navicularis, near the orifice.

CONSEQUENCES.—1. Repeated gonorrhœa may lead to *stricture* of the urethra; 2, to irritability of the bladder; 3, to a hard, dense, semi-cartilaginous state of the corpus spongiosum urethræ.

CAUSES.—We have shown gonorrhœa to be an inflammation and purulent discharge from the urethra, and have said that it is generally produced by contagion from a similar disease. But inflammation and purulent discharge from the urethra may be produced by many other causes, some of which have no connexion with sexual matters. Thus—

(*a*) In the first place, discharges resembling gonorrhœa may be caused by *local irritation.* Immoderate and protracted sexual indulgence; the introduction of bougies; blows on the perinæum;—violent bending of the penis during erection; and long travel in a jolting vehicle over bad roads, are well authenticated causes of such cases.† (*b*) By various *disorders of the constitution.* It has been a symptom of *rheumatism;* and not unfrequently it precedes a paroxysm of *gout.* It may be caused by *sympathy with irritation of other parts.* Thus it may be occasioned by *piles;*—and it has been known to accompany the cutting of a tooth several times in the same patient. (*c*) A discharge is liable to occur in patients affected with *stricture;*—and to recur in those who have been long habituated to it, upon any neglect of their health, exposure to severe cold, or *inordinate fatigue*, or *excess in food, wine,* or *venery.* (*d*) Lastly, discharges are sometimes (although rarely) occasioned by the *use of particular medicines.* Guaiacum and cayenne pepper have been named as some.

Again, a man may contract a pretty severe discharge from a woman who is perfectly chaste, and has not been previously infected by a third party. Thus—(*a*) The *menstrual fluid* is capable of causing urethritis with violent scalding and chordee, and followed by swelled testicle;—and a considerable degree of irritation may be produced by the vaginal secretions, just previous to menstruation.* (*b*.) Similar consequences sometimes ensue if the female be affected with *leucorrhœa*, or with any other discharge of any sort whatever.

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* For cases *vide* Judd, op. cit. p. 70.

† Vide Judd, op. cit. p. 32.

DIAGNOSIS.—The question next follows, whether there is any means of distinguishing the *simple gonorrhœa*, that is, a discharge which does not arise from sexual connexion, or which a man contracts from some accidental malady in a clean chaste woman, from the *venereal gonorrhœa*, or *clap*, caught from an infected prostitute.

The grand diagnostic sign laid down by writers,† is the comparative mildness of the former, and the absence of acute inflammation. And this is almost invariably true. Moreover, if, as Mr. Bacot observes, "a discharge come on only a few hours after connexion; and if it have continued several days without inflammatory symptoms; if the patient has been liable to some discharge after any excess of venery or of wine;—in all such cases the probability is, that the patient labours under some other diseased condition of the urethra, and that although the intercourse of the sexes may have been the exciting cause, still there may be no imputation on the cleanliness of the female."‡

But it is most important to observe, that although discharges may arise from many causes besides connexion, and although some discharges may arise from connexion with chaste women, yet that every one of them is capable of exciting a similar discharge in a healthy person.

The time at which the disease usually appears after contagion is the fourth or fifth day. The later it appears, the less severe it generally is; but in some very simple cases, produced by simple irritation, the discharge comes on immediately after connexion.

GONORRHŒA IN THE FEMALE.—This, unless the patient is very young and delicate, is a much more simple disease than it is in the male; since the parts affected are less complex in formation, and less important in function.

The *symptoms* are much the same. Heat and pain in making water: tenderness and soreness, especially in walking, uneasiness in sitting, and viscid muco-purulent discharge. On examination, the parts are found swelled and red, and if the case is severe, there may be excoriations or aphthous ulcerations. Sympathetic enlargement of the inguinal glands, and abscesses in the mucous follicles, are occasional complications.

DIAGNOSIS.—*Acute inflammation of the mucous membrane* of the labia, nymphæ, and vagina, is not unfrequent in young girls, as a consequence of teething; or of costiveness, worms, and other disorders of the alimentary canal; and it has precisely the same symptoms as gonorrhœa. It of course often excites great uneasiness, and painful suspicions in the minds of parents; but the surgeon may very easily remove their alarm by telling them that it is a common idiopathic disorder of children, and not a consequence of any improper treatment.

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* Judd, p. 24.

† Titley, op. cit. p. 186.

‡ Bacot, op. cit. p. 101.

Leucorrhœa or *fluor albus*, a mucous catarrh from the vagina, accompanying a general state of debility; as well as muco-purulent discharges arising from a diseased condition of the uterus, may be distinguished from gonorrhœa by the absence of heat or pain in micturition: and by the pain in the back, pallid countenance, irregular menstruation, and signs of exhaustion and debility which generally accompany them. An examination with the speculum must decide the question.

PROPHYLACTIC TREATMENT.—A patient who has been exposed to the chances of venereal infection would do well to wash out the front part of the urethra with a syringeful of some astringent lotion; and, if any fissures or excoriations are perceived, to touch them with lunar caustic, and apply a bit of dry lint.

CURATIVE TREATMENT.—The remedies for gonorrhœa are threefold; first antiphlogistic measures, to get rid of inflammation; secondly, certain medicines containing a volatile oil, which has a peculiar sanatory influence on the inflamed mucous membranes; and, thirdly, injections to wash away the discharge, and alter the action of the inflamed surface. These different remedies are to be combined in various degrees in different cases, and at different periods of the disease, recollecting always that gonorrhœa is a disorder which tends naturally to wear itself out; and that it is not to be cut short by mere antiphlogistic treatment, although its duration may be abridged, and its severity lessened.

Of the first stage.—If the patient apply during the very first stage, when the discharge is just appearing, and *before acute symptoms have come on*, the disease may almost infallibly be cut short, by employing the plan recommended by Ricord. Let him inject the urethra regularly once in four hours, with a solution of two grains of nitrate of silver to eight ounces of distilled water; let this be repeated twelve times, desisting, however, sooner if the discharge is rendered thin and bloody, which is the ordinary effect of the nitrate. Then let a weak injection of sulphate of zinc, or alum be substituted, and be continued till the discharge ceases. At the same time the patient should take a mild aperient; and after it, a dose of copaiba or cubebs, three times daily; he should avoid exercise, fermented liquors, salt, spice, coffee, and stimulants of every kind; he should take no supper; and should continue his abstemious regimen for a week or ten days after all trace of the discharge has disappeared. The penis should be wrapped in a piece of rag dipped in lukewarm or cold water.

The manner of injecting is of no small consequence, as the efficacy of the lotion depends entirely on its application to the whole of the diseased surface; and, as Dr. Graves observes, the ordinary opinion that gonorrhœa is limited to the anterior extremity of the urethra, is unfounded and mischievous. The patient should be provided with one of the glass syringes with a long, bulbous extremity, recommended by Mr. Acton;* and having filled it, should introduce it for about an inch with his right hand. Then, having encircled the glans penis with his left forefinger and thumb, so as to compress the urethra against the syringe, and prevent any of the fluid from escaping, he should push down the piston with his right forefinger, letting the fluid pass freely into the urethra; the syringe should now be withdrawn, but the orifice should still be compressed, and the fluid be retained for two or three minutes; after which, on removing the finger and thumb, it will be thrown out by the elasticity of the urethra. It is always worth the surgeon's while to *see* that the injection is properly used.

Of the second stage.—Supposing it to be a first attack in a young irritable subject, and that it has proceeded unchecked to the acute stage, the patient should be confined to the house for a few days, if his avocations permit it. Walking, and above all, horse exercise, should be prohibited. The penis and scrotum should be supported by a suspensory bandage, and be kept constantly wet with tepid water. The glans penis, if very irritable, should be protected by a piece of lint spread with spermaceti ointment. The diet should be moderate, to the entire exclusion of fermented liquors, and the patient should drink soda water, barley water, linseed tea, gum water, and other mucilaginous fluids. The scalding will be relieved by combinations of alkalis and sedatives (F. 174); and by a hip bath of the temperature of 80°; but the bath should not be *hot*, nor even warm, otherwise it will excite the circulation and bring on erections. The bowels should be opened with a dose of calomel at night, and some castor oil in the morning; and it is advisable to give half a grain or a grain of calomel, with gr. one-eighth of tartar emetic, and gr. x. of Dover's powder; or F. 63, &c., every night whilst there is much pain and chordee. The mercury is not necessary as a specific, but it is highly useful to check the inflammatory symptoms. As soon as the patient is free from fever, he should take copaiba or cubebs in moderate doses. The best preparation is the *capsule*, which should be taken just before a meal, and then it causes no eructations; but the pills with magnesia, F. 177, or the emulsion, F. 175, agree very well with some stomachs. Young irritable people, with light complexions, can seldom take these medicines without suffering from sickness or diarrhœa, or sometimes even from fever and a rash; and every combination of aromatic and opiate that can be devised will not enable the stomach to tolerate them.

If the patient is very plethoric, and suffers greatly from pain and fever, and has a hard pulse and white tongue; and if there be great aching in the bladder or perinæum; protracted agony after micturition; tenderness in the abdomen, pain in the back, or other signs of irritation of the urinary organs; it may be right to apply leeches to the perinæum, or even to take blood from the arm, and to administer opium pretty freely with antimony.

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* Described in the Med. Gaz., vol. xxix. p. 428. The plan of treatment recommended by Dr. Graves (Clinical Medicine, p. 304) is highly judicious, and almost precisely similar to that of Ricord and Acton.

It is decidedly not safe to use injections with young, delicate, irritable subjects during the acute stage, and most especially whilst there is any tenderness of the glands of the groin, or any aching in the spermatic cord or testicles, as they might easily produce swelled testicle, or great irritation of the neck of the bladder. And, as a general rule, it is best to refrain from them altogether, till the inflammatory symptoms are mitigated by the antiphlogistic remedies before mentioned.

Treatment of Complications.—Painful erections and chordee may be relieved by bathing the parts with tepid or cold water, and a diaphoretic, F. 63, &c., or a small dose of camphor and extract of henbane, at bedtime; F. 30; and if the chordee lasts long. a little mercurial ointment and extract of belladonna should be smeared on the part at bedtime. Hæmorrhage may be checked by cold, and pressure on the urethra. Inflammation of the mucous glands of the urethra is to be treated by leeches and poultices. An opening must be made if the swelling obstructs the flow of urine, but not otherwise. Swelling of the glands in the groin may generally be removed by rest, and, if necessary, a few leeches.

Of the third stage.—As soon as the acute stage has subsided, the patient should use the injections of nitrate of silver, followed by zinc, in the same manner as was recommended for the first stage. If the discharge does not cease entirely, or if it comes back again, other injections, F. 135—139, may be tried; adapting their strength to the irritability of the part, and not permitting them to cause severe pain.

But a gleet is often a very tedious complaint, and requires a judicious and long-continued course of remedies that act on the urinary organs, together with most temperate habits of living. Copaiba, either alone or combined with astringents, F. 176; and cantharides, especially in combination with zinc, F. 179, or steel, F. 180, are the most useful remedies. Mr. Acton has seen great benefit derived from injections of one grain of prot-ioduret of iron and an ounce of water, gradually increased in strength. The bowels should be kept properly open, but saline purgatives should be avoided. If the patient wants to make water oftener than natural, and there is an uneasy sensation in the urethra afterwards, and the urine deposits a mucous cloud, buchu and uva ursi (F. 181) will be advisable. The occasional passing of a bougie, large enough to fill the urethra without stretching it, will also be of material service. It is also highly useful in these cases to inject the urethra with cold water from an elastic bottle, twice a day. If the urine is preternaturally acid, or loaded with the phosphates; or the digestive organs deranged; the case should be treated as directed in the section on urinary deposits. If the health is materially enfeebled by debauchery or malpractices, affusion of cold water on the genitals, cold sea-bathing, blisters to the perinæum, bark and steel, good living, and perfect chastity of body and mind are the necessary remedies. If all other means fail, the *porte caustique* of Lallemand may be introduced, for the purpose of slightly touching the whole of the canal with the nitrate of silver; or a strip of linen, about eight inches long, may be introduced for a few hours. This is pushed by a stilet into the canal of a gum-elastic catheter, which is open at both ends; the catheter is introduced; then it is withdrawn over the stilet, which keeps the linen in the urethra, and lastly, the stilet itself is withdrawn, leaving the linen. These two plans are not applicable if the urethra is very irritable.

A *scirrhous or semi-cartilaginous condition* of the corpus spongiosum urethræ is always extremely difficult to get rid of. The frequent introduction of bougies; friction with ointments of mercury or iodine, warm bathing, and the internal use of Plummer's pill and iodine, afford the best chance of relief. Cases are recorded in which portions of osseous matter have been removed from the septum penis by incision.*

Gonorrhœal rheumatism must be treated on the same principles as common rheumatism. The bowels should be well cleared by calomel and black draught, and then colchicum should be given in doses of ♏xx. of the wine with magnesia, F. 71, every four or five hours, and a dose of Dover's powder at bedtime. In the chronic stage, F. 63, at bedtime;—iodide of potassium, sarsaparilla, bark, volatile tincture of guaiacum, sea air, tonics, and warm bathing, are the remedies. Bleeding can hardly ever be required.

THE TREATMENT OF GONORRHŒA IN THE FEMALE must be conducted upon precisely the same principles. During the acute stage, rest in the recumbent posture, fomentations of decoction of poppyheads with chamomile flowers, frequent ablution, lubrication with lard or cold cream—and very frequent sponging with a weak solution of alum, a piece of lint dipped in which should be inserted between the labia; with laxatives and diaphoretics, are the measures to be adopted, until heat, pain, and tenderness subside; afterwards injections of nitrate of silver, and sulphate or acetate of zinc should be used, just as has been recommended for the other sex; and they should be continued for some time after all discharge has ceased. But much greater liberties may be taken with the vagina than with the male urethra; and the disease may often be stopped at once, without risk, by the application of the solid nitrate of silver, as recommended by Jewel and others. It should be applied, however, either *before* the inflammatory symptoms have attained any height, or after they have subsided. *Terebinthinate medicines* (copaiba, &c.) may be given, although they do not do much good, unless the discharge proceeds from the urethra or its vicinity. Abscesses or other complications are rare; but if they occur, they must be treated on general principles.

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* Titley, p. 175.

SECTION III.—OF PRIMARY SYPHILITIC ULCERS.

General Description.—Primary syphilitic ulcers or chancres may be caused by the application of the syphilitic virus to any surface, mucous or cutaneous, entire, wounded, or ulcerated. Their most frequent *seat* is the genitals;—and in men they are more frequently than otherwise found on the inner surface of the prepuce, or the furrow between the prepuce and corona glandis, or the angle by the frænum;—obviously because those spots are most convenient for the lodgment of filth. It is notorious that persons with a long prepuce, whose glans is habitually protected by it, and covered with a delicate semi-mucous membrane, are more liable to suffer than those whose glans is uncovered, but clothed with a denser cuticle. The *time* at which venereal sores appear is usually said to be from the third to the tenth day after infection; but it is more probable, as Ricord observes, that the syphilitic virus operates progressively from the first moment of its application, but that the ulcer is fully formed by the fifth day; although it may not be perceived by a careless person till later. The average duration of a syphilitic ulcer produced by inoculation is, according to Wallace, twenty-five days.

Primary syphilitic ulcers present very many varieties. These varieties depend,—1st. On the peculiar sore from which infection was received; because every kind of sore, and especially the phagedænic, has a tendency to reproduce its like. 2ndly. On the state of constitution of the patient, and the degree of inflammation which is present. 3rdly. On the situation; and, lastly, on the local treatment.

It is impossible in this work to collate and describe the innumerable varieties of syphilitic ulcers that are spoken of by authors. For practical purposes it will suffice to consider them under three heads. 1st. the Hunterian, or indurated chancre; 2ndly, the non-indurated chancre; and, 3rdly, chancres complicated with sloughing or phagedæna.

I. The Hunterian Chancre, or indurated ulcer, is generally found on the common integument or on the glans penis. It may begin either as a pimple, or as a patch of excoriation which heals up, leaving the centre ulcerous. It is nearly circular; deep and excavated; the base and edges are hard as cartilage, but the hardness is circumscribed;* there is little pain or inflammation; its colour is livid or tawny; it is never so hard nor excavated when on the body of the penis as when on the glans.

It is this form of ulcer which is ordinarily produced when the pus of a chancre is inoculated into the sound skin for purposes of diagnosis. Supposing the inoculation to have been performed with the point of a lancet.—During the first twenty-four hours the puncture reddens; in the second and third days it swells slightly, and becomes a pimple, surrounded by a red areola; from the third to the fourth day, the cuticle is raised by a turbid fluid into a vesicle, which displays a black spot on its summit, consisting of the dried blood of the puncture; from the fourth to the fifth day, the morbid secretion increases and becomes purulent, and the vesicle becomes a pustule with a depressed summit. At this period the areola, which had increased, begins to fade, but the subjacent tissues become infiltrated and hardened with lymph. After the sixth day, if the cuticle and the dried pus which adheres to it be removed, there is found an ulcer, resting on a hardened base; its depth equal to the whole thickness of the true skin, its edges seeming as if cleanly cut out with a punch—its surface covered with a greyish pultaceous matter, and its margin hard, elevated, and of a reddish brown or violet colour.*

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* So that it has been said to feel like a little cup of cartilage set in the flesh.

II. THE NON-INDURATED chancre is most frequently found on the inner surface of the prepuce. It may be said to have four stages. In the 1st, it is a small itching *pimple*, or *pustule*, which bursting, displays—2ndly, a foul *yellowish* or *tawney sore*, attended with slight redness and swelling, and spreading circularly. It may or may not be covered at first with a dirty brown scab. In the 3rd stage it throws out indolent fungous granulations,—except it be situated on the *glans* (for the *substance* of the glans penis has no power of throwing out granulations, although its surface may), and is usually stationary for a little time after it has ceased to ulcerate, and before it begins to heal. In the 4th stage, it *slowly heals;* cicatrization being preceded by a narrow vascular line. The cicatrix is often red and indurated;—swelled, if on the prepuce; but depressed, if on the glans, from want of granulations. It is exceedingly liable to ulcerate afresh. If the ulcer be seated near the frænum, it is almost sure to perforate it.

Finally, an *excoriation* or a *fissure* of the prepuce may be infected, and may be followed by secondary symptoms. But if ulceration does not spread, it will be very difficult to say whether it is a venereal ulcer, or merely a common fissure or excoriation obstinate in healing; for, in both cases, it may appear yellowish and indolent. Inoculation is the test.

III. CHANCRE COMPLICATED WITH PHAGEDÆNA OR SLOUGHING.

(*a*) *Phagedænic chancres* are extremely rapid in their progress, and highly painful; their surface yellow and dotted with red streaks; their shape irregular; their edges ragged or undermined; and the discharge profuse, thin, and sanious. The surrounding margin of skin usually looks puffy and œdematous, showing a low grade of vitality; but sometimes it is firm and of a vivid red. Sometimes these ulcers eat deeply into the substance of the penis; sometimes they undermine the skin extensively; but in general they spread widely but not deeply. Sores of this last description are called *serpiginous*.

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* Ricord, op. cit. p. 89.

(*b*) *Sloughing phagedæna* affecting chancres requires no observations on its symptoms distinct from those made at page 78 *et seq.*

Simple or sloughing phagedæna may affect chancres or open buboes for two reasons. 1st, if the constitution be irritable and broken down by debauchery, night watching, exposure to cold and damp, or by the profuse administration of mercury, or by confinement in the foul pestiferous air of an hospital. Hence it is liable to occur to soldiers, sailors, prostitutes, and bakers;—the last-named class of individuals being obliged to work in the night. The serpiginous variety is, as Mr. Acton observes, extremely apt to affect "scrofulous individuals, or old men who have led a dissipated life; or men subject to the diseases of hot climates, and persons with skin diseases and constitutional complaints, whose health has been ruined by several courses of mercury." 2ndly, They may probably be produced by some peculiar acrimony of the venereal virus. There is reason for believing that intercourse between foreigners gives rise to a very destructive kind of poison. The venereal secretions of the Portuguese women appear to have been horribly deleterious to the British soldiers during the Peninsular war, who gave the expressive name of *The Black Lion* to the sloughing sores that resulted from connexion with them.*

(*c*) Chancres may be affected with *simple acute inflammation* leading to gangrene, from local irritation, such as horse exercise, and excess in stimulating liquors.

CHANCRE IN THE URETHRA.—Ricord has proved satisfactorily that this is the cause of the secondary syphilitic symptoms which were formerly attributed to gonorrhœa. The existence of chancre in the urethra may be suspected, if in a case of gonorrhœa the discharge is very capricious, sometimes thin, scanty, and bloody, sometimes thick and profuse; and if there is one painful indurated spot. But it can only be proved, either by the ulcer being visible at the orifice, or by inoculation with the matter.

SYPHILITIC ULCERS IN THE FEMALE require no distinct observations. They do not usually cause so much distress as in the male, but they are very slow in healing, especially if interfered with by the urine. When situated high in the vagina, they may cause no symptoms at all, except perhaps a mucous discharge, and can be detected only by the speculum.

SECTION IV.—OF THE AFFECTIONS THAT MAY BE MISTAKEN FOR CHANCRE.

The ordinary means of distinguishing a syphilitic ulcer are, that it is seated on the genitals; that it has followed a suspicious connexion; that it is probably circular, with hardened base and elevated edges; and above all, that, if treated with simple applications merely, it is extremely difficult to heal. But none of these characteristics are infallible. The surest test is that of *inoculation*, as proposed by Ricord. If some of the pus of a real chancre, taken *whilst it is extending and before it begins to heal*, be inoculated into the skin of the thigh, it will produce a regular chancre there, after the manner we have already described (p. 180). It may be right to adopt this practice in some few cases when the existence of chancre in the urethra is suspected; or when the characters of a sore on the penis are undecided; or when there is a sore suspected to be syphilitic on the face, or any other unusual part; or when it is wished to test the pus from a bubo; but the sore produced by inoculation must be destroyed by lunar caustic, or by nitric acid, as soon as its character is decided, else it may give both surgeon and patient a great deal of trouble.*

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* For an account of this interesting point in the history of syphilis, see the late Inspector-general Fergusson, Med. Chir. Trans. vol. iv., and Guthrie, *ib.* vol. viii.

AFFECTIONS THAT MAY BE MISTAKEN FOR CHANCRE.—This is the most convenient place for describing the nature and treatment of various affections that may be mistaken for chancre.

1. *Gonorrhœa externa*, or *balanitis*, is an inflammation of the surface of the glans and inside of the prepuce, with profuse purulent discharge, and excoriation of the cuticle. It generally affects dirty people with long prepuce, and is caused either by the acrid secretions of the part, or by contact with unhealthy secretions in the female. Sometimes, however, it occurs to cleanly people whose health is disordered. The thick profuse discharge, the peculiar smell, the superficiality of the excoriations, and their appearance immediately after connexion, distinguish this complaint from chancre; and a little opening medicine, common soap and water, and any mild astringent lotion will suffice to cure it. Lime-water is the best lotion if there is much inflammation, and a grain of corrosive sublimate to an ounce and a half of lime-water if there is not. If the cure is not effected in two or three days, the excoriations should be touched with nitrate of silver. Sometimes balanitis is attended with very great inflammation and fever, and with *phymosis*, from the great swelling of the prepuce; and the pain may be so severe and gnawing, as to make the surgeon uncertain whether there is not a phagedænic ulcer concealed by the foreskin. The thick discharge, and the pain being general and not confined to one spot, form the chief means of diagnosis; and repeated injection of warm water and astringent lotions under the foreskin are the remedies.

2. *Minute aphthous-looking points*, sometimes in clusters, sometimes surrounding the glans; some of them healing, whilst others break out. They are totally devoid of pain; and although they may last a long time, do not lead to ulcers. They are best treated by black wash or mere lime-water, or lotions of *arg. nit.* or *cupr. sulph.* and alteratives and aperients.

3. *Herpes præputialis*† begins with extreme itching and sense of heat. The patient examining the part, finds one or two red patches,

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* It must be recollected that inoculation, if performed from a sore that is healing will produce no pustule; but yet that sore may be of venereal origin, and would have yielded an infectious matter at an earlier period.

† Bateman on Cutaneous Diseases, 5th ed. p. 238. Burgess's Cazenave, p. 88.

about the size of a split pea. On each patch are clustered *five or six minute vesicles*, which, being extremely transparent, appear of the same red colour as the patch on which they are situated. In twenty-four or thirty hours the vesicles become larger, milky, and opake ; and on the third day they are confluent and almost pustular. If the eruption is seated on the inner surface of the prepuce, the vesicles commonly break on the fourth or fifth day, and form a slight ulcer with a white base and rather elevated edges. If this ulcer be irritated by caustic or otherwise, its base may become as hard as that of a chancre. If left to itself, it mostly heals in a fortnight; sooner, if situated on the external skin. The *cause* of this complaint is either some derangement of the digestive organs, or irritation within the urethra, which should be ascertained by the bougie. It is very liable to recur in the same individual, which of course, if known, will greatly aid the diagnosis. *Treatment.* — A little dry lint, or goldbeater's skin, at first, and subsequently a very weak lotion, with aperient and alterative medicines.

4. *Psoriasis præputii*, painful, irritable, and bleeding cracks or fissures around the edge of the prepuce,—best treated by ung. hydr. nitr. dil., and arsenic internally.

SECTION V.—OF THE TREATMENT OF PRIMARY SYPHILIS.

Local Treatment.—It seems to be pretty well established, that if a chancre lasts for a few days only there will be no fear of secondary symptoms, and no need to administer mercury. If, therefore, a patient applies so soon as he perceives the chancre, it will be advisable to touch it thoroughly with a stick of nitrate of silver, and destroy it ; then give an aperient, enjoin rest and low diet, and wrap the penis in rag dipped in warm water, to prevent inflammation. But if the sore has lasted more than a week, the nitrate of silver will not act deeply enough to destroy it effectually; and the potassa fusa, or strong nitric acid, must be employed instead.

But the foregoing plan cannot be adopted with safety if the chancre presents a well-marked indurated lump, or if the penis is swelled and inflamed, and the patient feverish, or if there is any swelling or tenderness in the groin. When this is the case, the local applications should consist of some liquid capable of chemically decomposing the poisonous secretions of the sore, and of a strength proportioned to the existing irritation. Black wash ; a very weak solution of chloride of soda, and decoction of oak-bark with a little tincture of catechu, which Mr. Acton uses as a substitute for the *vin aromatique*, the favourite application of M. Ricord, are the most useful. If there is very much irritation the penis should be enveloped in a poultice of boiled camomile flowers. If there is much induration Ricord recommends an ointment of calomel. Afterwards, during the indolent and granulating stages, the sore may be treated with any astringent lotion, and be touched occasionally with nitrate of silver or sulphate of copper.

Constitutional Treatment.—If there are none of the contra indications that will be mentioned presently, the patient should take mercury. Not because it is absolutely necessary in all cases, but because it *hastens the cure of the primary sores*, and affords a *more decided security against secondary symptoms.* But before doing so, it will be right to open the bowels by blue pill and black draught;—and to prescribe low living, rest, and saline medicines, *till local pain and inflammation and any general disorder of the system have been removed. A warm bath* or two may also be useful. But great care must be taken not to induce weakness.

Then the object is to induce a *gentle* mercurial action, and to maintain it *long enough;* and the latter point requires to be especially insisted on in the present day, because surgeons, in order to avoid giving too much mercury, now seem inclined to give too little. Five grains of blue pill should be given every night and morning; and if no effect on the mouth is produced by the fourth day, the dose at night should be doubled. This will rarely fail, in another day or two, to produce *a very slight* soreness and sponginess of the gums with a *slight* increase of the saliva, which is all that is wanted; for the only *use of salivation* is to show that the system is affected. The mercurial influence should be steadily maintained for four or five weeks, and until the sore has healed and all hardness of the cicatrix has vanished. If the mouth become *too sore*, the dose should be lessened;—if the soreness *subside too soon*, it may be increased; or two or three doses of calomel may be added. Meanwhile the patient should live regularly, but not too low:—he should avoid all excess of food or wine, and acescent vegetables, and everything likely to disorder the bowels;—his clothing should be rather warm, so as to keep the skin perspirable;—and, above all, he should most sedulously avoid fatigue, cold, wet, and night air.

The *strong mercurial ointment* is not so likely to disorder the bowels as the blue pill, but it is more troublesome, and is now almost an obsolete remedy. The dose is from ʒß—ʒj;—to be rubbed in daily upon the inside of the thighs or arms till it disappears. The morning is the best time for doing it, as the skin is then softer; it should be rubbed on different limbs successively; the patient wearing the same drawers both by night and day. If the skin becomes irritated, it should be well washed and bathed. If the patient is too weak to rub in the ointment himself, it must be performed by a servant, whose hands should be protected by a pig's bladder, well softened in oil and tied round his wrist. In some cases it may be expedient to subject the patient daily to a vapour-bath, medicated with the vapour of from 20 to 60 grains of cinnabar.*

If *calomel* is preferred, two or three grains may be given every night, combined with a little opium: but it is more apt to purge, and should be used only with strong robust people, who would be unaffected by milder means.

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* Langston Parker; vide Ranking's Abstract, vol. iv.

THE ILL EFFECTS OF MERCURY that require to be guarded against are as follow: 1. *Griping and purging* —which are to be obviated by combining a small quantity of opium or hyoscyamus with the blue pill, and giving occasionally a draught with P. rhæi ℈j, tinct. ejusd. fʒj, tinct. opii ♏xx, aq. menth. fʒx. It is far from uncommon for a slight attack of *dysentery* to occur, especially about the time that salivation commences; there being sickness and severe griping, with frequent straining and ineffectual attempts to go to stool. This should be treated by the draught just mentioned, followed by opiate enemata and the warm bath,—the mercury being omitted for the time.

2. *Sore throat;* redness of the whole fauces, and sloughing or ulceration of the tonsils with fever. In this case the mercury must be discontinued, till leeches, gargles, and aperients have set the throat to rights;—and then it may be resumed in smaller doses.

3. *Violent salivation.* This may be caused by a too liberal use of the remedy; or by a sudden check to the cutaneous secretion by cold and damp; or by loss of blood, or anything that suddenly lowers the system. It is, however, very common to meet with persons who are salivated by the smallest quantities conceivable; and every practitioner should make a point of ascertaining this, before he prescribes mercury for any new patient. There is good reason for believing that a great susceptibility of salivation, and tendency to Bright's disease of the kidney often go together. The *symptoms* of severe salivation are, swelling and inflammation of the salivary glands, cheeks, tongue, and fauces, with a flow of peculiarly fetid saliva, and ulceration or even sloughing of the gums. The best *local applications* for this state are, gargles of brandy and water, to which a little of the solution of chloride of lime may be added, or gargles of tannin, or of hydrochloric acid (F. 107, *et seq.*). The bowels should be kept open by aperients; and, as soon as fever has abated, the patient should have a good diet and tonics. Change of air, and especially removal from the venereal wards of an hospital, are indispensable. If the salivation is very obstinate, repeated blisters should be applied behind the ears, and to the throat.*

4. *Eczema mercuriale* (*Eczema rubrum*, *Erythema mercuriale*, *hydrargyria*) consists of patches of redness and inflammation, which appear first on the groins, axillæ, and flexures of the limbs, and then spread over the trunk. These patches are covered with minute vesicles, which soon burst, discharging a thin acrimonious fluid, and leaving the surface excoriated, and exceedingly painful and tender. The discharge often becomes profuse and fetid, and the affected parts much swollen and fissured. It generally lasts for ten days, but may remain for many weeks.† *Treatment.* Warm bathing, mild and

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* Dr. Macleod relates two cases of coma following the sudden cessation of salivation; one fatal; the other cured by reproducing it. Lond. Med. and Phys. Jour., vol. lvi. p. 231.

† One variety, *hydrargyria maligna*, now almost unknown, is attended with typhoid fever. Eight out of fourteen cases died. Alley on Hydrargyria. Lond. 1810.

unctuous applications, aperients, diaphoretics, salines, and opiates, during the early stages ;—subsequently, bark or sarsaparilla, and the mineral acids. Dr. Colles has described another and less severe form of eruption, which resembles the itch, except that the intervals between the fingers are free from it ; the treatment is the same. When a *patient who is disposed to these affections reverts* to the use of mercury, the doses should be small, combined with hyoscyamus, and he should carefully avoid heat, violent exercise, and everything else that excites the cutaneous circulation.

5. *Erethismus mercurialis* consists in a tendency to palsy of the heart. The symptoms are great depression of strength; anxiety about the præcordia, dyspnœa, frequent sighing, weak and tumultuous action of the heart ;—frequent sense of suffocation, disturbed sleep, and faintness upon any exertion ; which faintness may prove fatal. *Treatment.* Removal to a fresh atmosphere ; stimulants ; especially the mistura moschi ; tonics ; and good living.*

If during the mercurial course any *febrile or inflammatory attack* arise, it is a general rule to discontinue it until such a state has been removed. And if the *patient become thin and feeble ;* losing his appetite and strength; complaining of disturbed sleep, night sweats, cough, or any other symptoms indicative of debility, his diet must be generous, and sarsaparilla or cinchona and other tonics must be liberally administered; and if these symptoms continue, notwithstanding the mercury is given in diminished doses, it must be relinquished altogether. Corrosive sublimate with tincture of bark is often useful when the mineral cannot be taken in the regular way. F. 82—85, 87, &c.

If the *patient is very easily salivated*, the doses must be very small, and at distant intervals, and the strength must be well supported by tonics and good living. If, on the other hand, as sometimes happens, the *mercury seems to make no impression* on the system, the patient should use the warm bath and live low. If very robust, he may be bled and purged. But the doses must not be very much increased, lest they suddenly induce violent salivation, or *erethismus.*

There are some *patients whom it is scarcely advisable to subject to a mercurial course*, viz., those actually labouring under *consumption* or *scrofula;* or who are extremely debilitated, or who are liable to the erethismus.

For these and other cases in which mercury is unadvisable, the *iodide of potassium* has been proposed as a substitute; in doses of gr. i.—iii. *ter die.* It produces a great flow of urine. In over doses, it causes sickness, salivation, and emaciation; with symptoms of violent cold in the head and swelling of the eyes. Mr. Smee has recommended tartar emetic in doses of gr. $\frac{1}{8}$—$\frac{1}{4}$ every four or five hours, both in primary and secondary syphilis. It may be combined with iron or zinc if there is much debility.†

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* Vide Dr. Bateman's case. Med. Chir. Trans. vol. ix. Colles' Lectures on Surgery. vol. ii. 242.

† Med. Gaz., Sept. 10th, 1842.

Sarsaparilla and guaiacum, as combined in the *compound decoction of sarsaparilla*, appear to maintain the secretions, especially those of the skin and kidneys, to increase nutrition, and allay morbid irritability of the nervous and circulating systems. Hence they are admirable remedies for debility during or after a mercurial course; and for the multifarious variety of symptoms that arise when the health is broken down as well by the disease as by its remedy.

The *gangrenous chancre* (*when occurring in healthy subjects, with firm pulse*) requires to be treated by the early and free abstraction of blood ; and then the bowels having been opened, and the pulse being reduced, opium should be given pretty freely in combination with salines and antimonials. The poppy fomentation is the best application at first, and the balsam of Peru, or nitric acid lotion subsequently, to assist in throwing off the sloughs. The ulcer which remains is usually healthy, and is very seldom followed by secondary symptoms; therefore *there is no need of mercury unless the sore begin to ulcerate*, (there being nothing in the general health to account for it), or unless *secondary symptoms* appear.

The *phagedænic and phagedæno-gangrenous chancre* must be treated according to the state of the system. If there are fever and thirst, with a full habit and harsh pulse, and vivid arterial inflammation, the case should be treated antiphlogistically ; if, however, the constitution is broken down and the pulse quick and feeble, bark and opium should be given freely;—and if the application of a strong solution of opium does not stop the phagedæna, the diseased surface must be destroyed by nitric acid, as directed at p. 82 ; and this will probably require to be done repeatedly, before the diseased disposition is got rid of. Mercury is inadmissible (as a general rule) when chancres are affected with inflammation, sloughing, or phagedæna.

If *phymosis* is present, and there is a discharge from under the prepuce, which cannot be turned back, the case may either be one of mere *balanitis*, or there may be a chancre under the prepuce. If there be an ulcer, it may be detected by local hardness and tenderness. Whilst there is any inflammation, fomentations and water-dressing must be applied, and a mild astringent lotion should be injected frequently between the prepuce and the glands. The prepuce should be slit up, if the tumefaction is so great that it threatens to slough; but not otherwise. If phymosis be caused by *small ulcers at the edge of the prepuce* (which sometimes occur during the healing of venereal sores,) they should be touched with *arg. nit.* or *cupri sulph.*, or *ung. hydr. nitrat.*

As soon as the *frænum has been perforated* by an ulcer, it should be completely divided.

Chancre in the urethra must be treated by astringent injections; and by mercury, if not contra-indicated by any of the circumstances above mentioned.

SECTION VI.—OF BUBO.

Definition.—Bubo signifies an inflamed lymphatic vessel or gland leading from a venereal ulcer.

Causes.—Any local irritation will, in certain habits, cause inflammation of the lymphatics;—in gonorrhœa, for instance, the glands in the groin are apt to swell. But the genuine syphilitic bubo arises from absorption of the poisonous secretions of a chancre; and the ordinary time of its appearance is, just as the ulcerative stage of the chancre is ceasing.

Varieties.—(1.) *Bubo of the Penis* consists of an inflamed lymphatic vessel on the penis.

(2.) *Acute bubo* at the groin generally affects only one gland, and pursues the course of an ordinary acute abscess. The cellular tissue between the gland and the skin is the common seat of suppuration, but there may also be a small abscess in the centre of the gland, arising no doubt from the absorption and transmission of poisonous matter, and the pus of this latter is alone capable of producing a chancre by inoculation.

(3.) *Indolent or chronic bubo* very commonly affects more than one gland. It occurs in weak, scrofulous habits, and especially in persons worn out by the improper administration of mercury. The glands slowly enlarge ; suppuration is slow and imperfect, and commences at several points. The skin is long before it inflames, but when it does so, a large tract of it becomes of a dusky bluish tint ; the matter spreads widely;—and at last large portions of the skin perish by ulceration or sloughing, leaving an extensive sore that may be months in healing.

Diagnosis.—If a bubo at the groin affect one gland only, and that above Poupart's ligament, it is most probably caused by chancre on the penis, provided there be, or has been, one. But if many glands are swelled, and they are below the level of Poupart's ligament, the swelling is probably caused by some irritation about the foot. But the only sure diagnosis of a syphilitic bubo is, that, if the matter taken from it be inoculated, it will produce a chancre ;—or that the sore produced by opening the bubo presents the elevated edges and copper-coloured margin of a chancre. As, however, every bubo is attended with suppuration of the surrounding cellular tissue, the surgeon should recollect that some of the matter taken when it is first opened may not cause chancre by inoculation.

It has been supposed by some surgeons, that the syphilitic virus, if applied to the skin of the penis, might be taken up by the absorbents and produce a bubo in the groin without having first caused a chancre. Such supposed cases are called *bubon d'emblée* by the French. But though it is very certain that the inguinal glands are apt to inflame and suppurate, if a person of bad constitution, who is disposed to such affections, indulges in immoderate sexual intercourse (especially if at the same time his health is lowered by fatigue, or irregular living), still there is not the slightest proof that such buboes are syphilitic, unless preceded by chancre; and the surgeon is not justified in administering mercury, unless he can produce chancre by inoculation with the discharge, or unless decided secondary symptoms occur.*

TREATMENT.—1. The *acute* bubo must be treated as an acute abscess. The first indication is to produce resolution;—by rest, aperient and saline remedies, low diet, leeches, and fomentations. The applications to the chancre must be soothing, and mercury, if being administered, should be at once given up. Sometimes, it is true, a rapid exhibition of it causes a rapid disappearance of the bubo;—but more generally it hastens suppuration, and it certainly predisposes to subsequent ulceration. It may be easily resumed afterwards. As soon as the tenderness is relieved, pressure by means of a compress and bandage is useful. Even if matter does form, the surgeon should be in no haste to evacuate it;—but should endeavour to procure its absorption by repeated leechings, discutient lotions, or painting it with a strong tincture of iodine, with aperients, attention to the health, and change of air. When the case becomes chronic, frictions, bandages, &c., may be used to remove any swelling that remains.

But if the matter increases, and the skin becomes inflamed and shining, a puncture should be made, and the case be treated as any other acute abscess.

2. In treating the *indolent bubo*, the general health must be amended by every possible means; tonics, the acids, sarsaparilla, change of air, and especially a sea voyage;—with occasional leechings and cold lotions, when demanded by an aggravation of heat and pain. If these measures fail, and matter forms, and the skin is becoming bluish and thin, a blister may be applied;—or the diseased skin may be rubbed with *arg. nit.*; which measures will either promote absorption, or at least stimulate the parts to a healthier action. But if the matter continue to increase, the swelling should be opened either by rubbing it with *potassa fusa*, or by applying the nitrate first, and then opening it with a lancet;—either plan having the advantage of causing diminution of the swelled glands, and preventing the spread of ulceration. Mercury should not be given;—except, perhaps, in alterative doses towards the close of the case.

In treating the sore formed by opening a bubo, the first thing is to get rid of the loose red skin. This may be done (as soon as the part is becoming indolent and swelling is abated) by cutting it away with scissors, or by the potassa fusa. A solution of nitrate of silver is the best dressing afterwards.

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* An officer in the Rifles, young, tall, and eminently lymphatic in temperament, told the Author, that whilst serving in Canada in 1841, a large cluster of glands in the groin swelled and suppurated after immoderate sexual indulgence. He was attended by one civil and three military surgeons; and this surgical staff was equally divided in opinion, whether the complaint was syphilitic or not.

Sometimes there remain one or two indolent enlarged glands, projecting in the midst of the sore, denuded of skin, and incapable of forming healthy granulations. These may be destroyed by caustic in the following way:—An ounce of bread crumbs, two drachms of corrosive sublimate, and one drachm of red oxide of lead, mixed into a paste with a little water, may be made into conical troches of the shape of bread-seals; and one of these may be inserted into a puncture in the diseased gland, which it will speedily cause to slough.

Sinuses, if they are not soon healed by stimulating injections, may be slit up.

If the ulcer become *inflamed* or *irritable*, or spread by ulceration, or if it be attacked by *sloughing*, or *phagedæna* (which may destroy the patient by exhaustion, or by laying open the femoral artery), the same treatment must be adopted that has already been directed for similar ulcers in other parts. *Vide* p. 78, *et seq.*

SECTION VII.—OF SECONDARY SYPHILIS.

The symptoms of secondary, or constitutional syphilis, generally occur about six weeks after the primary symptoms;—sometimes a fortnight, sometimes not for months. Before their appearance, the patient generally becomes thin and wan;—he looks dispirited;—his eyes are heavy;—and he complains of want of appetite and sleep, and of rheumatic pains.

The effects of constitutional syphilis are usually first manifested upon the skin and mucous membrane of the throat, and then upon the bones. We shall first describe these several local affections, and then the treatment of secondary syphilis generally; but syphilitic affections of the eye and testis, which generally accompany those of the throat, will be treated of in the chapters that are particularly devoted to those organs.

Syphilitic Eruptions vary in degree from the slightest discoloration to the most inveterate ulcers. 1. In the mildest form, the skin is mottled and stained in irregular patches of a brownish red colour; which are caused by a slight swelling and vascular injection. A greater degree of the same derangement will produce *syphilitic psoriasis*, in which the skin is raised in copper-coloured blotches, covered with scales of hypertrophied cuticle. Or there may be an eruption of *papulæ* or pimples, varying in size from a pin's head to a pea. These eruptions are succeeded merely by scabs or exfoliations of the cuticle.

2. *Scaly Eruption (Lepra syphilitica)* is an aggravated variety of the preceding. It begins with an eruption of copper-coloured blotches, which become covered with scales of enlarged cuticle;—these are succeeded by scabs, and, when they fall off, by shallow ulcers with copper-coloured edges.

3. *Vesicular Eruption (Rupia.)* Large flattened bullæ, filled with serum, which gradually become purulent, and finally dry into scabs,

under which the skin is ulcerated. The ulcers spread under the scabs, and the latter become remarkably thick from successive additions.

4. *Pustular Eruption (Ecthyma).* Large prominent pustules, with a copper-coloured base, leading to ulcers.

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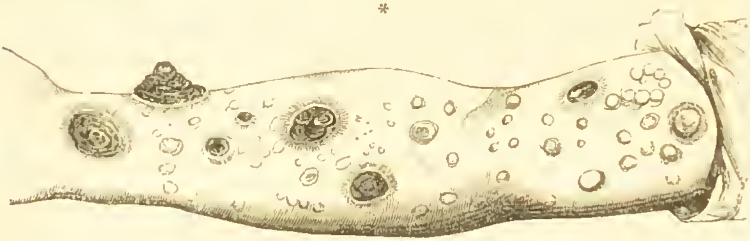

5. *Tubercular Eruption.* Broad, red, copper-coloured tubercles, forming most frequently at the alæ of the nose, or on the cheeks. They gradually suppurate, and are succeeded by deep irregular ulcers, terminating in puckered cicatrices, and more properly belong to the class of tertiary symptoms, in which mercury is almost inadmissible. This form of disease is most unfavourable, and usually appears at a considerable distance of time from the primary symptoms, in persons whose constitution is originally weak, or has been shattered by privation, dissipation, or frequent unavailing courses of mercury. A patch of this kind of unhealthy inflammation is apt to form on the tongue, and after a time an abscess breaks, disclosing a ragged excavation, filled with orange-coloured sloughs, and exuding a copious fetid discharge. If it occurs on the palate, a probe will detect bare exfoliating bone; which rapidly perishes and leaves a hideous chasm.

Condylomata or mucous tubercles are soft red fungous elevations of the surface of the skin, generally situated about the anus, or between the scrotum and thigh, or at other parts where two cutaneous surfaces are in contact. They are covered with a thin cuticle, like that of mucous membranes, and often exude a copious thin fetid discharge. They generally occur together with psoriasis or lepra. This affection is common in Ireland, where it is called *button scurvy*, and is believed to be contagious; which M. Ricord denies, unless it occurs on the site of a chancre which has been imperfectly healed.

Syphilitic Sore Throat.—1. The mildest variety is a superficial excoriation of the mucous membrane of the tonsils or some other part of the mouth or fauces, corresponding to psoriasis on the skin. The parts affected are swollen and sore; sometimes red and raw, and sometimes covered with a white secretion, or with a patch of thickened epithelium. This state may be succeeded by a superficial ulceration.

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* This cut exhibits the crusts of rupia; from a cast in the King's College Museum.

2. The *excavated* ulcer looks as if a piece had been scooped out of the tonsil. Its surface is foul and yellow, its edges raised, and ragged, and swelled. There is remarkably little inconvenience from it, and very little constitutional affection, unless it be attended with eruption likewise. The patient has a peculiar guttural way of speaking, and often complains of pain in the ears.

3. The *sloughing* ulcer begins as a small *aphthous* spot, which rapidly ulcerates, and is attended with great pain and fever. The surface of the ulcer is covered with an ashy slough, and the surrounding mucous membrane is dark, livid, and swollen. The lingual artery may be opened by the spread of the ulceration, and the patient may die of hæmorrhage, unless the common carotid is tied.

SYPHILITIC ULCERATIONS of the nose and palate commence with ulcerations of the mucous membrane, similar to those of the throat, which may denude the periosteum, and then produce exfoliation of the bones, with profuse fetid discharge and odious deformity. Ulceration of the nose generally begins with a sense of heat, and dryness, and snuffling.

Syphilitic ulceration of the larynx is mostly caused by an extension of ulceration from the palate. It is characterized by tenderness, great huskiness of voice (which frequently degenerates into a mere whisper), suffocative cough, and expectoration of bloody purulent matter; there is great loss of flesh and strength, and life is often terminated by suffocation.

SYPHILITIC DISEASE OF BONE most frequently attacks the tibia, ulna, os frontis, clavicle, and other superficial bones. It commences with tenderness of the affected bone, and severe pain, which begins in the evening, and lasts almost all night, but ceases in the daytime. The pain is shortly accompanied with oblong swellings, called *nodes*, arising from infiltration of the periosteum with lymph and serum. These swellings are rather tender; they communicate a doughy feeling, or obscure sense of fluctuation to the fingers, and the skin over them is at first pale and moveable. If the disease is arrested at this stage, it causes merely a superficial deposit of rough porous bone, from the organization of the lymph effused; or else a consolidation of the bone itself through the deposition of fresh osseous matter into its cancelli. If the disease proceed one step further, a quantity of glairy serum is effused between the periosteum and bone, producing an exquisitely painful fluctuating tumour. If it advance still further, the bone becomes carious; matter forms between it and the periosteum; extensive exfoliations ensue ; the patient suffers severely from the pain and discharge; and if the disease be seated on the head (in which situation it is called *corona veneris*), death may ensue from irritation of the dura mater, or protrusion of the brain through apertures in the skull. Such aggravated cases are fortunately, however, now very rare; although common enough when mercury was supposed to be the only means of stopping the ravages of the disease.

Diagnosis.—There is often some difficulty thrown into the surgeon's way, by the denial of patients that they have ever had any primary symptoms. If, however, the patient has a copper-coloured eruption, a sore throat, falling off of the hair, enlargement of the glands around the occiput, and a general faded unhealthy look, and these disorders are of recent date, and cannot be attributed to any causes connected with diet or residence, the probability is that they are syphilitic.

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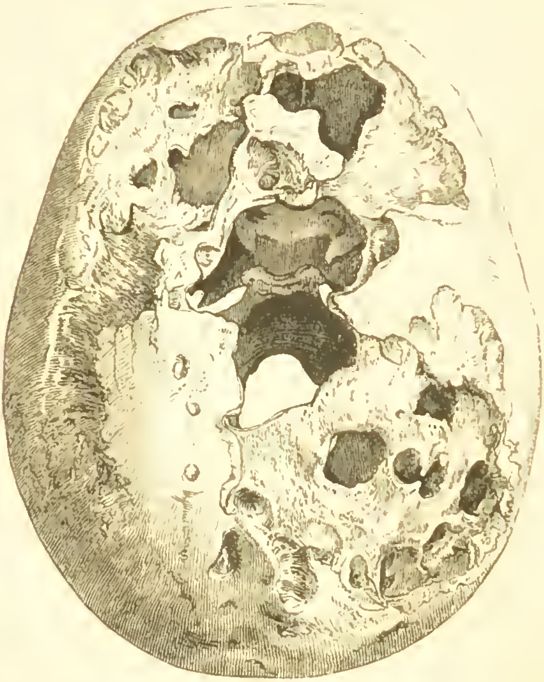

Treatment.—In the first place, if a venereal eruption and sore throat are ushered in with pain in the chest and other febrile or inflammatory symptoms, it will be necessary to give aperients, and saline medicines with antimony, and to restrict the diet, and confine the patient to the house. The warm-bath will also be highly useful.

When the febrile state has vanished, if the patient has never taken a course of mercury,—or if he has been subjected to an imperfect course of it for the primary symptoms,—and his constitution is sound, he may take mercury after the manner directed in the fifth section. If, under its use, the strength and general appearance are improved,

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* This cut shows the ravages of syphilitic caries. From the King's College Museum.

so much the better;—but if the patient gets thinner, weaker, and haggard, and suffers from chills or feverishness, or if his ulcers become irritable and phagedænic, it must be given up. The mercurial vapour bath, or the corrosive sublimate in very small doses, and not carried to the extent of affecting the mouth, will often be of great service when a full course of the mineral is inapplicable, F. 86.

The iodide of potassium is the remedy next in efficacy to mercury, and should be administered when the former is deemed inexpedient. Sometimes it is useful to combine it with iodine, F. 88, &c.

Sarsaparilla, F. 82, &c., is a remedy that may almost always be used with advantage. It may be combined with corrosive sublimate or the iodide of potassium; or may be administered after a course of those remedies, to restore the flesh and strength. The mineral acids, especially the nitric;—sedatives, especially hyoscyamus and conium, F. 34;—tonics, F. 1, 2, 3, 4, 5;—and tartar emetic in minute doses, F. 68, will be all of service in protracted cases. In these the surgeon will find it necessary to change and vary his remedies repeatedly. The main object should be to improve the general look and condition of the patient,—to treat symptoms,—never to push a remedy, if it does manifest harm, under the vague idea that it is specific; and, never to attempt to produce sudden benefit by large doses of mercury, or other violent remedies, which may weaken or impair the constitution.

Local Treatment.—For syphilitic eruptions, the warm, vapour, and sulphur baths will be often expedient. Obstinate patches of lepra or pimples may sometimes have their removal hastened by ung. hydr. nitratis diluted, or the ung. hydr. precipitati albi, or the ung. picis. Itching eruptions may often be relieved by a weak lotion of corrosive sublimate. Ulcers must be treated according to their condition—whether inflamed, irritable, or indolent. In general, weak mercurial applications, such as black wash, or weak red precipitate ointment, answer best.

Condylomata are, according to Ricord, best treated by washing them with a solution of chloride of soda, and then sprinkling calomel over them, and applying dry lint. Calomel ointment answers as well.

For the common excoriated sore throat, any soothing detergent gargle will do.—F. 107, 108. When there are ulcers, it is advisable to use gargles of corrosive sublimate (F. 112); and when the ulcers are indolent they may be touched with the *linimentum æruginis*. *Mercurial fumigation* is also occasionally of benefit. It is effected by putting a scruple of red sulphuret, or of the common *black oxyde*, or twice the quantity of *mercury with chalk* on a heated iron in a proper apparatus, and inhaling the vapour—a heated pennypiece in a teacup will answer the purpose. When a foul ulcer is seated on the velum, or roof of the mouth, or pharynx, or alæ nasi, an attempt may be made to check its ravages, by destroying its surface and edges with nitric acid.

Ulceration of the larynx is occasionally benefited by similar fumigation; but mercury so as to affect the mouth is almost always injurious;—as it is in other cases of rapid ulceration. Sarsaparilla and sedatives, blisters to the throat and occasional leechings, swabbing with solution of arg. nit., and the operation of tracheotomy, if the breathing becomes much embarrassed, are the necessary measures.

The pain of nodes is often relieved by blisters, and so are rheumatic pains of venereal origin. Sometimes it is useful to dress the blistered surfaces with strong mercurial ointment and opium. Acute inflammation of the periosteum or pericranium, is sometimes relieved by a rapid administration of calomel and opium; although in venereal disease of bone, the use of mercury requires the greatest caution, and is only admissible if the patient has a sound constitution, and has never taken a course of it. It is peculiarly noxious when there is caries of the bones of the nose. When nodes are very tense and full of fluid, it may be necessary to puncture them, but this should be avoided if possible. If during secondary syphilis, the nose becomes tender or painful, the greatest benefit will be derived from the application of one or two leeches twice or three times a week to the inside of the affected nostril. At the same time, the patient should take plenty of sarsaparilla, with small doses of iodide of potassium, and should have the benefit of country air, and a nutritious diet. By these means, any further mischief will sometimes be averted. If, however, ulceration does occur, it is of the utmost consequence to remove any loose or carious portions of bone, as soon as possible.

Syphilis of Children.—When a man labours under constitutional syphilis, it is probable that he may communicate it to his wife; but, at all events, if the wife has it, she may communicate it to the fœtus. The consequence is sometimes that the infant dies about the fourth or fifth month, and the woman miscarries repeatedly. Sometimes a child is born weakly and shrivelled, with hoarse voice, discharge from the nostrils, and copper-coloured blotches or ulcers, especially about the anus and pudenda. Sometimes, again, it is born healthy, but these symptoms appear a month afterwards. Lastly, a child may be inflicted with primary syphilis during its birth.

The parents in these cases should take a course of mercury, and be treated in other respects for secondary syphilis. And for the children, the best plan is to rub ten grains of mercurial ointment daily into the axilla, or soles of the feet, or to administer half a grain or a grain of hyd. c. creta every night till the symptoms disappear. The prognosis is always favourable; and although the symptoms are apt to recur once or twice, they are in general easily removed by a short repetition of the remedy.

PART IV.

OF THE INJURIES AND SURGICAL DISEASES OF VARIOUS TISSUES, ORGANS, AND REGIONS.

CHAPTER I.

OF THE DISEASES OF THE CELLULAR TISSUE.

SECTION I.—CARBUNCLE AND BOIL.

DEFINITION.—A carbuncle signifies an unhealthy inflammation and sloughing of a circumscribed portion of the cellular tissue.

SYMPTOMS.—It begins with a hard, circumscribed, livid red swelling, and with severe burning, smarting pain. Its most prominent part soon becomes soft and *quaggy*, and numerous small ulcerated apertures form on it, which give exit to a thin discharge, compared by Sir A. Cooper to flour and water. These ulcers gradually unite, and form a considerable opening, from which a slough of cellular tissue is slowly protruded; and when that is separated, the parts may granulate and heal. The most usual situations of carbuncle are the back, the nape of the neck, and the nates. The tumour may vary in size from that of a half crown to that of a small plate.

CAUSES.—Carbuncle is always an evidence of a vitiated state of the blood and disorder of the digestive organs; and it usually afflicts elderly people, whose health and spirits are impaired by intemperance, or by hard study, or anxiety of mind. It sometimes appears to be the means by which some poisonous matter is thrown out of the system;* in corroboration of which idea, Sir B. Brodie mentions a case in which a carbuncle disappeared suddenly, and the patient began to sink and die at the same moment. It is often attended with considerable fever, and almost always with loss of appetite and flatulence. And it may be attended with great danger to life, if the patient is very old or weak —or if the carbuncle is very large, and seated on or near the head.

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* Carbuncles, and unhealthy abscesses, are frequent consequences of what is called the *water cure;* and the Germans persuade themselves that they constitute a critical evacuation of diseased humours; but it is far more probable that they are owing to the exhausted vitality of the skin, which is so inordinately taxed to relieve the system of the immense quantity of water with which the blood is deluged.

Treatment.—The objects of the local treatment are, to afford a free exit to sloughs and discharge, and to excite the diseased tissues to healthy suppuration and granulation. In the first place, therefore, a free incision should at once be made completely through the tumour; —and if the tumour is extensive, it should be scored across by a second incision at right angles to the first. Then warm poultices should be applied; and if there is much atony about the system, the yeast poultice, F. 155, or linseed meal poultice mixed with a little port wine, or beer-grounds, or unguentum resinæ, will be advisable. Stimulating ointments and lotions, especially the nitric acid lotion, F. 119, will complete the cure.

The indications for the constitutional treatment are, first, to evacuate and correct the secretions of the alimentary canal. This is to be effected by purgatives, which should be given in repeated doses, till the motions become light yellow and bilious, instead of dark, grumous, and offensive;—or, at all events, so long as the patient feels lighter and better under their use. It is best to begin with a good dose of calomel, and a warm aperient draught; and to follow these with blue pill, and the warmer aperients, such as rhubarb, and decoction of aloes, with ammonia, F. 37. Very often an emetic, composed of a scruple of ipecacuanha, followed by a cupful of warm camomile tea, or F. 99, will be of service. When a feeble patient takes calomel for the purpose of unloading the liver, good beef-tea, or hot spiced wine and water, F. 27, should be administered before and during its operation to prevent faintness. Tonics, and alteratives must be given according to circumstances.

Boils are miniature carbuncles. The best plan is to cut them through as soon as possible, poultice for a day or two, and then apply stimulating plasters; such as the empl. galbani, vel ammoniaci. A few doses of mild aperient medicine should be given; and if they continue to come out in successive crops, a course of alteratives, such as Plummer's pill, sarsaparilla, saline or sulphurous mineral waters, and sea-bathing;—but the liq. potassæ, or sodæ carb., in moderate doses, three times a day, are generally considered of most utility. "I was myself always troubled with boils," says Hunter, "until I took forty drops of this lixivium (of soda) night and morning in milk for two months, when all my boils disappeared, and I have since had no return of them." *

SECTION II.—TUMOURS.

I. The Common Vascular Sarcoma, or *simple fleshy* or *fibrous tumour*, is a yellowish-white, firm, fleshy, or fibrous mass;—with few blood-vessels;—often surrounded with a coat of condensed cellular tissue ;—and sometimes containing irregular patches of earthy deposit. When examined microscopically, its structure is seen to be identical with that of natural fibrous tissue, and the fibres are arranged concentrically;—not rectilinearly as in scirrhus. If boiled, it yields gelatine ; scirrhus does not.

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* Lectures in Palmer's Ed., vol. i. p. 610.

In *external character*, it is a firm, lobulated tumour, circumscribed, moveable, and free from tenderness, unless accidentally inflamed. It is also free from pain, unless it press upon some sensitive part. It grows slowly but steadily, and when it has attained considerable bulk, the veins on its surface become enlarged and tortuous. The favourite *seats* of this tumour are the subcutaneous and submucous cellular tissue, and especially that of the womb. As to its *consequences*, (1) it may last the whole life of the individual, without any ulterior consequences. Or (2) it may, by its enlargement, inflame the skin, or mucous membrane covering it, and cause obstinate and dangerous ulceration ; or may even slough out entirely. (3) It may produce sundry inconveniences, or even death, by pressure on various parts.

Diagnosis.—It is known from abscess or inflammatory tumour by its *slow*, but *steady*, and *painless* enlargement. To distinguish it from malignant disease, the points to be attended to are, " the effect upon the constitution ;" that is, the presence or absence of the *cancerous cachexia ;*—and the extent to which the tumour is connected with the surrounding parts.* For the non-malignant tumour can generally have its outline traced, and the line of separation between it and the neighbouring parts clearly made out ; and the skin or mucous membrane can be made to move freely over it. Not so in the case of a malignant tumour. The non-malignant is also more smooth and regular than schirrus. H. Bennett believes them identical at first, and indistinguishable. It is often stated that these tumours may *degenerate into scirrhus*, or *take on malignant ulceration ;* but Dr. Walshe believes, that though the ulcers arising under the circumstances stated above may be dangerous or intractable, yet that a real malignant growth is seldom if ever deposited in fibrous tumours. The proper *treatment* is extirpation with the knife.

II. THE FATTY TUMOUR consists of lobulated masses of fat, very slightly vascular, and contained in a cyst of cellular tissue. In *external character*, it is a softish, lobulated, painless tumour, feeling like fat. Its *growth* is slow, but progressive ; and it may attain enormous bulk, even forty pounds. Its *terminations* may be the same as those of the last-named tumour, and its *treatment* should be also the same.

Operation.—An incision—rather too long than too short—should be made along the tumour, and through its cellular cyst. If the skin adhere to it (but not otherwise), a portion may be removed by two elliptical incisions. Next, the tumour should be removed as rapidly as possible, partly by cutting its cellular adhesions, partly by tearing them with the finger. Then the wound should be examined to ascertain that the extirpation is complete;—and after bleeding has ceased it should be closed, and healed by the first intention. Sometimes fatty tumours may be removed by passing a seton through them, so that they may waste away in suppuration. This method is more tedious and painful than excision, but it may be adopted when it is an object to avoid a long cicatrix,—on the face, for example.

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* See the points of diagnosis instructively stated in Fergusson, op. cit. 2nd edit. p. 144.

III. ENCYSTED TUMOURS, or *Wens*, occur most frequently under the skin of the head. They consist of a sac, smooth on its internal surface, and containing various matters, which, if examined under the microscope, are found to consist of epithelial cells, oil globules, and crystals of stearine. These are secreted by the lining membrane of the sac, which is in all probability an obstructed sebaceous follicle of the skin. The contents are sometimes like curd or rice (such tumours being formerly called *atheroma*); sometimes like suet (*steatoma*); sometimes like honey (*meliceris*); sometimes mere water; sometimes hair, or matter like horn. These tumours are painless, rounded, elastic, circumscribed, moveable, and they fluctuate indistinctly, according to the greater or less fluidity of their contents. They enlarge slowly and steadily.*

Treatment.—Extirpation is the only remedy. Punctures, setons, injections, or any means for obliterating them by exciting inflammation, are very hazardous; because the cysts (like all new textures) are liable, if irritated, to give rise to excessive and dangerous inflammation. Ointments of iodine, or other substances for creating absorption, are perfectly useless, and may be mischievous. If, however, the tumour is small, its aperture (a little black spot) should be looked for, a probe may be passed into it, and the contents be squeezed out as often as necessary. Otherwise, a straight, double-edged, pointed bistoury should be thrust completely through the tumour, then the cut edge of the sac should be seized with forceps, and the whole of it be dissected out.

IV. THE PAINFUL SUBCUTANEOUS TUMOUR is a small hard body, rarely larger than a pea or coffee-berry, seated immediately under the skin, liable to fits of excruciating pain, and supposed to be formed in the substance of a nerve. It must be extirpated. The removal of such a tumour from the breast has cured an obstinate hysteria.†

V. MALIGNANT GROWTHS.—The subcutaneous cellular tissue may be the primary seat of malignant growths, which run the ordinary course of such affections. And in some rare cases nodules of scirrhus or encephaloid have been formed in extraordinary numbers over the surface of the body, giving rise to great diversity of diagnosis.‡

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* Vide Erasmus Wilson's paper in the Med. Chir. Trans., vol. xxvii.

† Wood in Edinburgh Med. Chir. Trans., vol. iii. Lond. Med. Gazette, vol. vi. p. 59.

‡ Vide Ancell on a remarkable case of tumours, Med. Chir. Trans. vol. xxv.; Dorrington, on a case of *disseminated globose carcinoma*, Med. Gaz., Feb. 4, 1842; Harrison, *ib.*, Feb. 24, 1843; Walshe, op. cit. p. 575.

CHAPTER II.

OF THE SURGICAL DISEASES OF THE SKIN.

I. General Hypertrophy.—The skin may grow into pendulous flaps or ridges, which, if inconvenient, are to be removed by incision.

II. Warts or vegetations, consist of elongated papillæ of the cutis vera, clothed with cuticle. When they are situated on an exposed part of the skin, the cuticle is thick, and they are generally dry, hard, and insensible; but when they are situated at the upper part of the thigh, where two surfaces of the skin are in contact, their cuticle is thin, and they exude serous discharge, which is contagious.

Causes.—They may be produced by the irritation of diseased secretions; and hence frequently follow gonorrhœa and syphilis, especially in women; but although their secretions are contagions and may cause fresh crops of warts to appear, yet they have nothing of a syphilitic nature, and require no mercury. They often come on the hands of children, and disappear without any assignable cause.

Treatment.—If their shape permit, they may be snipped off or tied;—or if in very inconvenient situations (as about the finger nails), may be cut out;—but the surface from which they grew requires some astringent to be frequently applied, in order to prevent their reproduction. If they cannot be removed in this manner, they may be destroyed by stimulants, of which the following are the most generally used: viz. one drachm of muriatic acid with three drachms of muriated tincture of iron; liquor plumbi diacetatis; liq. hydrarg. oxymur.; liq. arsenicalis; liq. aluminis comp.; nitrate of silver; equal parts of powdered savine and verdigris; one drachm of arsenic dissolved in half an ounce of nitric acid; and the juice of garlic, spurge, or sumach.*

III. Corns are growths of thick cuticle, and are produced when the skin, situated over some projecting point of bone, is irritated by frequent pressure or friction. It need scarcely be said that their usual seat is on the joints of the toes, and that tight boots or shoes are their usual cause. They are divided into two kinds, the hard and the soft. The hard are situated on the surface of the foot, where the cuticle can become dry and hard; the soft between the toes, where the cuticle is soft and spongy. We must observe, however, that what are commonly called *soft corns* between the toes, are not corns, but excessively irritable fungous warts, and consist of a growth from the cutis vera, not of a mere thickening of the cuticle. According to Sir B. Brodie, when a corn is completely formed, a minute bursa is developed between it and the cutis vera.†

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* Brodie, Lecture on Mortification, Med. Gaz. vol. xxvii.

† Brodie, Lecture on Corns, Med. Gaz. vol. xvii. p. 775; Key on Bunion, Guy's Hosp. Rep. vol. i. p. 416.

Treatment.—The points to be attended to are, to have the boots or shoes properly adapted to the shape and size of the foot;—to wash the feet frequently in warm water; to cover the corns constantly with a plaster composed of equal parts of soap-plaster and oil, spread on kid leather; or, if they are very tender, with a bit of linen thickly spread with spermaceti ointment, so that they may be kept soft and pliable, not hard and dry; and to remove the growths of cuticle frequently with a blunt knife. If these directions are attended to, a cure may be confidently promised in ordinary cases. But some feet are so misshapen originally, or the toes are so crowded together by wearing small, low, pointed shoes, that it is impossible to contrive any shoes that will not press and create corns somewhere. In some of these cases the application of several plasters of thick soft leather, each having a hole punched in it to receive the corn and relieve it from pressure, is a very useful device. But if the corn is on the sole of the foot, it must be covered with a piece of adhesive plaster spread on linen, before the circular plasters are applied, otherwise the weight of the body will cause the flesh to bulge into the holes, and occasion much pain in walking. Sometimes it is useful to put a sole of felt into the shoe, with a hole in it to receive the corn. If the cuticle is excessively hard, its exfoliation may be hastened by rubbing it with nitrate of silver, or liniment of ammonia, or by touching it with a hair pencil dipped in strong nitric acid, or the chloride of antimony. For the soft corns between the toes, the nitrate of silver is the best application. When a corn inflames, and the bursa between it and the skin suppurates, the pain is often most excruciating, and only to be relieved by paring it down and letting out the fluid.

IV. HORNY TUMOURS are formed by an inspissation of the matter of the sebaceous follicles, and by laminated growths of epithelium from their interior. They are easily removed by two oval incisions.*

V. CHELOID TUMOUR.—Under this name is described a peculiar tumour, consisting apparently of a thickened reddish patch of skin, partly covered with a thin wrinkled epidermis, and generally found in clusters on the neck and breast. This disease is rare; and seldom or never leads to ulceration, although it is occasionally the seat of shooting pains.†

VI. TUMOURS OF CICATRICES.—The coloured races of mankind are occasionally liable to an hypertrophy of the skin at the site of some old cicatrix. Extirpation with the knife is the only remedy.

VII. CANCROID, OR SEMI-MALIGNANT AND MALIGNANT AFFECTIONS.—The characteristics of cancroid or semi-malignant growths are, that they resemble malignant disease in many outward respects; that is, that they are incurable if left to themselves, destroying the tissues in which they are situated, spreading progressively and destroying the parts in their vicinity, and being finally fatal to life from their constant irritation ; — still that they do not appear in several remote organs simultaneously, and do not return if effectually removed, and on microscopical examination are said not to contain the peculiar constituents of malignant growths, although they cannot be distinguished from them by the naked eye.

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* Vidè Erasmus Wilson, Med. Chir. Trans. vol. xxvii.

† Warren on Tumours, p. 40; Burgess's Translation of Cazenave, p. 305; Mayo's Pathology, p. 236.

1. One of the most important examples of such diseases is what is called the *chimney sweeper's cancer* of the scrotum, which is further treated of in Chapter XXI. Sect. 3. It may be taken as the type of a class of cancroid affections of the skin, which commence as warty growths, composed of hypertrophied epidermic scales, which grow, soften, ulcerate, throw out fungous masses, spread, and finally destroy the patient by exhaustion. Another very similar affection is that which Mr. Cæsar Hawkins has designated the *warty tumour of cicatrices*, which occasionally appears on old scars. "There appears, in the first place, a little wart, or warty tumour in the cicatrix, which is dry and covered with a thin cuticle, but which soon becomes moist, and partially ulcerated, like the warts of mucous membranes, from which a thin and semi-purulent fluid is secreted. In this stage it gives no pain or inconvenience." After a time the warts are converted into a more solid tumour like fungus hæmatodes, very vascular, and easily bleeding when touched. And this finally ulcerates or sloughs, forming a foul excavated ulcer, with fresh growths of warts around it, which may destroy the patient by its constant irritation and discharge. The remedy is extirpation with the knife; or amputation of the affected limb, if the diseased growth is very extensive; and the patient may be confidently assured, that if thoroughly extirpated it will not return.*

2. There is a class of affections hitherto thought to be cancerous, which is particularly liable to affect the skin near one of the natural orifices of the body where there is a great abundance of follicles (as the lip or glans penis), or else on some part of the face or neck. The most common forms are,—1st, A small tubercular deposit, generally of a reddish or dirty grey hue, which, after continuing perhaps for years in an indolent or slowly enlarging state, becomes irritated, and degenerates into a foul ulcer. 2nd, *Infiltration* of a portion of skin with scirrhous-looking matter, producing a darkish thickened appearance, something like a mole. This generally soon becomes covered with a crust of cuticle, resembling the bark of a tree (whence Dr. Warren applied the term *lepoides* to this affection); under which, in process of time, ulceration slowly proceeds. 3rd, Sometimes a chap or fissure, arising apparently from accidental causes, assumes a hardened scirrhous-like base, and becomes a foul ulcer.

It has always been agreed that cancer of the skin is of slower growth than cancer of other parts; that it is much less liable to be attended by malignant disease of the viscera; and that it is much less likely to return after thorough extirpation. This is rationally accounted for by the researches of Hughes Bennett, who shows clearly that many of the so-called cancers of the lip, are in reality destitute of the true cancerous structure. Speaking of one case he says, "the disease presented all the characters of cancer to the naked eye, consisting of a scirrhous tumour composed of white carcinomatous looking matter externally, with gray encephaloid matter internally. A microscopic examination showed that the latter was altered muscular tissue, and that the former was an hypertrophy of the epidermis. The epidermic alteration consisted externally of numerous large epidermic scales, mixed with fusiform corpuscles, and a number of round cells with round nuclei, such as are frequently found in certain fibrous growths."

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* Cæsar Hawkins, Med. Chir. Trans. vol. xix. Yet, to show how incomplete is the separation between cancerous and cancroid growths, Mr. Robert W. Smith has published a case in which one of these growths in the leg was followed by cancerous cachexia and similar growths in the groin and death. Dub. Quar. Jour. Med. Sc., May, 1850.

Yet true cancer does occasionally occur in the skin, the filamentous tissue of the dermis being hypertrophied, and expanded into nodules, and infiltrated with cancer cells.

Treatment.—Since it is often impossible to decide by anything but microscopical examination, whether a case be truly cancerous, or only cancroid, and since in the latter case extirpation is a cure, the disease should be removed either by the knife or by the chloride of zinc, or arsenic as caustics. Arsenic may also be administered internally.

The surgeon should deal in the same manner with *moles* (oblong patches of imperfectly organized skin with black matter in its interstices), small vascular patches, and other congenital imperfections of the skin, if at any time they seem inclined to spread and become irritable, because it is possible that they might become the nidus of malignant growths.

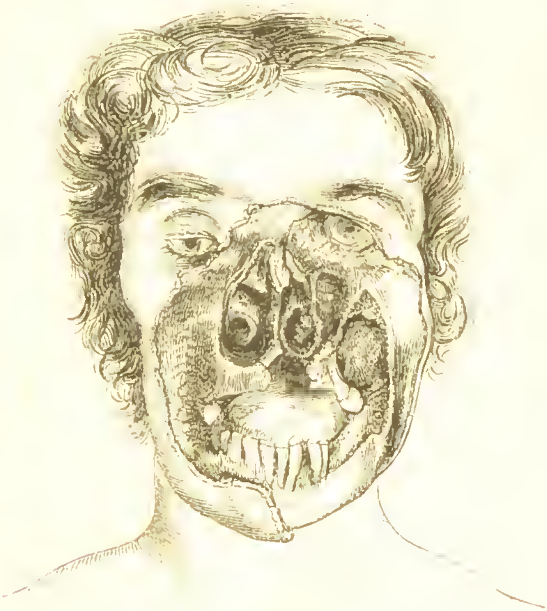
VIII. LUPUS—a destructive ulceration of the skin commencing with tubercular inflammation. There are two forms; 1st, the genuine lupus, *herpes exedens,* or *noli me tangere;* and 2ndly, the *herpes,* or *lupus non exedens.*

1. *Lupus exedens.*—A portion of the skin of the face (mostly on or near the *alæ nasi*) inflames, swells, and becomes of a bright red tint. The swelling frequently occurs in the form of one or more *tubercles;* not however indurated like scirrhus. The inflamed surface sooner or later becomes excoriated, and secretes an ichorous matter which dries into a scab. After a time, a painful, foul, excavated ulcer forms;—variable in its progress, sometimes stationary, or partially cicatrizing; but, in the end, destroying the flesh of the nose and cheek, and causing caries and exfoliation of the bones; till the patient, a horrid spectacle, dies worn out with pain; his eye dropping from its socket into the chasm made by the destruction of the cheek. This affection mostly occurs to adults; especially if of weakly scrofulous habits, vitiated by intemperance and gross feeding.

2. The *lupus non exedens* is a milder form, and attacks scrofulous children. It begins with shining tubercles, which ulcerate; but the

ulceration has a tendency to spread *widely*, rather than *deeply*; causing prodigious deformity by the successive ulceration and puckered cicatrization of the face.

Treatment.—The indications are, 1st. To correct the general health by opening the bowels, keeping up the secretions, promoting appetite and digestion, and allowing a regular nutritious diet. A course of Plummer's pill, with alkalis and sarsaparilla; or of the liq. arsenicalis in small doses, or in scrofulous cases of the iodide of potassium, will generally be of great service.



2ndly. To alter the diseased action by stimulants. If ulceration has not commenced, the part should be rubbed frequently with nitrate of silver, so as to keep it constantly covered with a black crust. If ulceration has commenced, the nitrate may be applied in the same manner;—or in the form of a lotion. But the best applications for ulcerated lupus are the arsenical. Now, arsenical applications should be either *very weak* or *very strong*; they should either produce *mild stimulation* or *sphacelus*. They should either be so weak as not to do any harm if absorbed into the blood; or so strong as immediately to kill the part they are applied to, and so to render it incapable of absorbing them. The weak may be tried first—in the form of F. 124, in order to act as a mild stimulant and alterative.

3rdly. But if these measures do not speedily succeed, the diseased surface must be destroyed by escharotics, of which arsenic and the chloride of zinc are the best. The *arsenic* may be applied in the form of ointment or solution (ʒi. ad. ℥i.) on lint, suffered to remain four or five hours. The *chloride of zinc* is a highly deliquescent salt, and is therefore ingeniously recommended by Mr. Ure, who introduced its use into this country, to be combined with two parts of fresh burned plaster of Paris, or it may be mixed with flour. In either case it is to be made into a paste with a little water, and be spread accurately with a spatula on the diseased surface, and allowed to remain for four or five hours. It causes severe pain for eight or nine hours, which, however, may be relieved by opium. When a suspicious tubercle is increased rapidly, but not ulcerating, it should also be destroyed with the chloride; but in this case, the cuticle should be first removed with the liquor ammoniæ.

Caustic pastes may also be made with two parts of powdered *potassa fusa*, and one of soft soap; or of three parts of quick-lime, and two of dry soap, moistened at the time of using with spirits of wine; or of three parts of caustic potass and two of fresh burned lime incorporated in a hot iron mortar. The last is called the Vienna paste; the lime is useful in correcting the deliquescent and diffusive power of the potass. When either of these caustics is used, the neighbouring sound parts should be protected by layers of sticking plaster.

After the sloughs have separated, which generally happens in from six to twelve days, according to their depth, the surface must be treated with a weak solution of nitrate of silver; but as often as there appears any return of the ulcerative process, the caustic must be applied again and again.*

CHAPTER III.

OF DISEASES AND INJURIES OF MUSCLES, TENDONS, AND BURSÆ.

I. Simple Atrophy of muscle, with more or less fatty degeneration, may arise from want of exercise, however caused. Moreover, it sometimes happens, that after a fever, or after injury, or disease, or exposure to cold, or after some affection of the nervous centres, one arm, or one leg, or both legs are smitten as it were with a blight. The affected member is always chilly; its skin is numb: it is imperfectly nourished, and decreases in bulk; if the patient is young, it ceases to grow in proportion with the other parts of the body; and its flexor muscles often become affected with rigidity, so that the joints are immovably bent and contracted.

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* Ure on Lupus and the Chloride of Zinc, Med. Gaz. vol. xvii. and xviii.; and Cyclop. Pract. Surg. *Art.* Cauterants; Earle, Med. Chir. Trans. vol. xii.; Travers, *ib.* vol. xv.; Burgess' Trans. of Cazenave, p. 250; Brodie, Surgical Lectures; Walshe, op. cit. p. 548; Liston, Lectures in Lancet, 1844, vol. i. p. 775.

Treatment.—Steel, quinine, cod liver oil, and other tonics; warm clothing and liberal diet; stimulating frictions, affusion with cold water, passive exercise, shampooing, and electricity or galvanism.

II. Rigid Atrophy is a state in which a muscle becomes short, rigid, and inextensible; and it generally, by its shortening, causes various displacements and deformities of the parts to which it is attached;—thus clubfoot is a consequence of this condition of the muscles of the calf.

Causes.—1st. It may be induced by *long inactivity* of the antagonist muscle;—thus, after long-continued disease of the knee, the flexor muscles of the ham may become shortened and inextensible, keeping the joint permanently bent, and often dragging the tibia off from the condyles of the femur. 2ndly. It may be a sequel of a species of *subacute inflammation*, which occasionally affects muscles or their investing fasciæ, and which is attended with pain, tenderness, and spasm. 3rdly. It may be a sequel of *habitual spasm*, by whatever cause produced.

Treatment.—In the earlier stages this affection may be relieved in various ways. By cupping, fomentations, or the steam bath, and subsequently blisters over the affected muscles, if there is any evidence of local inflammation. By purgatives and tonics, if the spasm appears to arise from disordered bowels or any other sympathetic source. By mechanical extension with splints, &c. But in cases of long standing, the only remedy that can be relied on is *division* of the affected muscle or its tendon; by which means the divided parts will retract; they will unite by lymph, and will consequently be lengthened, and then extension and the other measures may be pursued with greater vigour and efficacy. (For further illustrations refer to Clubfoot and Wry Neck.)

III. Acute Atrophy.—In this affection one or more muscles rapidly waste away, and their wasting is attended with severe pain, especially in the course of their nerves. It appears to depend on a rheumatic inflammation of the muscular nerves, and to be caused by exposure to cold.*

IV. Rupture of Muscles and Tendons.—This is an accident which is frequently caused by violent muscular contraction; especially if, after illness or long inactivity, the muscles are subjected to sudden and severe exertion. The muscles which are most frequently ruptured are, the gastrocnemius, the rectus femoris, which sometimes is entirely detached from the patella,† and biceps flexor cubiti; but more frequently the tendons give way, especially the tendo Achillis, and flexor tendons of the wrist. "It occasionally happens," says Mr. Liston,

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* Two cases of it are given in Mayo's Pathology, p. 117. The author has seen several, which all attempts have failed to cure.

† Vincent, op. cit. p. 71.

"to gentlemen of mature years, who, forgetting these, join in the sports of youth as they were wont to do ; suddenly they suppose that some one has inflicted a blow on the leg from behind—their dancing is arrested, the foot cannot be extended, and the nature of the case is forthwith evident to the most careless observer."*

The *symptoms* of this accident are, sudden pain, or sometimes an audible snap, loss of the motion peculiar to the muscle, and a depression at the ruptured part, which may be felt with the fingers. The reparation is effected by the effusion and organization of lymph, which forms a *callus* like that of broken bone.

Treatment.—The main point is to keep the injured muscle in a state of constant rest and relaxation,† so that the severed ends may be in close approximation, and to prevent any violent extension till the union is firmly consolidated. Pain and inflammation must be counteracted by leeches, and cold or warm lotions. When the tendo Achillis, or the gastrocnemius muscle is ruptured, the knee may be kept bent by a string passing from the heel of the slipper to a bandage round the thigh. For ruptures of the extensors of the thigh, the limb must be placed in the same position as in fracture of the patella. If the biceps is ruptured, the elbow must be kept bent to its utmost; if the tendons about the wrist or fingers, the forearm must be confined by a splint. After three or four weeks of this rest, the surgeon may use *passive motion;* that is, may bend and extend the joints of the injured limb with his hands several times successively. But the patient must be cautious in using the muscle for a long time; and (if it be the tendo Achillis) must walk with a high-heeled shoe for two or three months; so that the recent callus may not be stretched and lengthened, which would cause permanent weakness.

V. Strains.—A strain signifies a violent stretching of tendinous or ligamentous parts, with or without rupture of some of their fibres. It produces instant severe pain, often attended with faintness; and great tumefaction and ecchymosis; with subsequent weakness and stiffness. If the part is not kept at rest, or if the knee or some other large joint is affected, there will be great pain, inflammation, and fever, that may lead to serious or even fatal results.

Treatment.—The most essential measure is perfect rest; and to ensure this, if the case is at all serious, the part must be confined by a pasteboard splint. Warm fomentations generally give more relief than cold lotions; but in this, as in similar cases, the patient's feelings are the safest criterion. If inflammation runs high, or a large joint is affected, leeches, or bleeding, and general antiphlogistic measures, must be adopted. Subsequently the indications are to procure absorption of thickening and extravasation, by friction with stimulating liniments, moderate exercise, and bandages, especially the flannel bandage. If the case is severe, it may be expedient to apply a succession of blisters, and the other remedies directed for chronic inflammation of joints.

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* Liston's Practical Surgery, 3rd ed. A case of ruptured rectus femoris is related in the Med. Gaz., Oct. 10th, 1841. It did not unite.

† Muscles are to be relaxed by putting them into a position the reverse of that which they occupy when in greatest action—not by merely approximating their attachments. Vincent, p. 11.

VI. ACUTE INFLAMMATION OF FASCIÆ.—Acute inflammation of fasciæ is generally caused by punctured wounds:—especially by puncture of the fascia of the biceps during venesection;—and by punctures of the fingers, inflammation of the tendinous sheaths of which is called *thecal abscess; paronychia gravis*, or *tendinous whitlow.* It is attended with severe, tensive, throbbing pain; exquisite tenderness; slight, but tense and resisting swelling; and very great constitutional disturbance. It may lead to suppuration;—the matter extending itself along muscles and tendons—from the fingers to the forearm—causing sloughing of the tendons—severe irritative fever—life often obliged to be saved by amputation—or the limb, if preserved, stiff and useless.

Treatment.—If the pain and tension increase, notwithstanding the employment of leeches, fomentations, and purgatives, *free incisions* must be made through the inflamed parts; in order to give vent to matter, if it have formed—or by creating a free discharge of blood, to prevent its formation.*

VII. SUBACUTE INFLAMMATION OF FASCIÆ.—Subacute inflammation sometimes affects the fasciæ of the forearm, hand, or neck; producing pain and tenderness, with spasm in the subjacent muscles, which may degenerate into obstinate rigidity, producing one form of wry-neck, &c.

Treatment.—Leeches, fomentations, blisters, mercurial camphorated liniments, F. 150, 160; vapour bath; very small does of colchicum and Dover's powder at bedtime, with aperients in the morning; or blue pill, administered so as to cause incipient ptyalism.

VIII. TUMOURS ON TENDON AND LIGAMENT.—Small tumours about the size of a pea are apt to form on the tendons or fasciæ. Sometimes they follow a strain; and they have been known to occur on the palmar fasciæ after a good day's work at the oar; but they often arise without any assignable cause. If indolent, as they often are, they may be left to themselves, and they will probably disappear. If painful, leeches, blisters, and frictions with mercurial ointment or liniment, are the proper remedies.

IX. CHALKSTONE TUMOURS are composed of the lithate (or urate) of soda; a white insoluble substance, which in gouty subjects is frequently deposited into the texture of the bones, joints, and cellular tissue;—but most frequently into the cellular tissue that environs the tendons of the feet or hands. The tumours which this substance forms are not always inorganic, but may be permeated by exquisitely sensible threads of cellular membrane. After remaining indolent for a variable time, they inflame the superjacent skin, and cause the formation of ulcers that are extremely obstinate, and discharge vast quantities of the concretion. They must be treated with simple dressings. It is rarely expedient to meddle with these tumours with the knife; but if any one be very inconveniently situated, and be perfectly indolent, it may be extirpated. The wound must be expected to heal very slowly.

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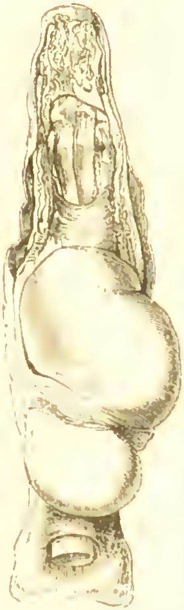
* Vide Whitlow, in part iv. chap. 24.



X. Ganglion and Tumours of Bursæ.—The simplest affection of bursæ and of the synovial sheaths of tendons, is excessive secretion of synovia, and consequent formation of a tumour, to which the name of ganglion is given. A recently formed ganglion is an indolent fluctuating tumour, transparent enough to permit the light of a candle to be seen through it. It contains a clear synovia; but tumours of those bursæ which may be formed by friction—such as the bursa which forms the swelling of bunion, do not contain synovia, but a viscid, semi-fluid substance, like the crystalline lens. The ordinary situation of ganglion is, of course, that of the various bursæ;—on the patella, or olecranon; or on the inner side of the head of the tibia; or the angle of the scapula; but most frequently about the wrist and fingers. When the general sheath of the flexor tendons at the wrist is affected in this way, it forms a remarkable tumour, which projects in the palm of the hand, and also above the wrist, but is bound down in the middle by the anterior annular ligament of the carpus. When ganglion has lasted some time, or has been subjected to inflammation, the synovial membrane becomes thickened, the contained fluid turbid and mixed with flakes of lymph, and the tumour loses its softness and transparency. The ordinary cause of ganglion is a twist or strain of some kind, or irritation from pressure or friction.*

Treatment.—(1.) The best plan of treating recent non-inflamed ganglion seems to be, either to puncture it with a grooved needle, or else to make a subcutaneous incision into the sac; that is, to introduce a needle with a cutting point, and to turn the point against the inside of the sac and divide it; without, however, making a larger wound in the skin than is necessary to introduce the needle. The object of these operations is to empty the sac, and form an aperture by which its contents may henceforth pass into the cellular tissue and be absorbed. As soon as it is emptied, constant pressure should be applied by means of compress and bandage, which may be wetted with cold lotion if agreeable. (2.) If this plan fails, recourse may be had to blisters, friction with mercurial and other stimulating liniments; or Scott's ointment, F. 160, or the *iodine paint*, F. 89, with a view of exciting absorption. (3.) In obstinate cases it is a good plan to dissect out the cyst of the ganglion—provided that it is formed of a mere bursa, (as over the patella or olecranon,) and has no connexion with the sheaths of tendons. (4.) But if the bursa is large or deeply seated, as over the angle of the scapula, it should be punctured with a lancet, when it may probably inflame and suppurate, and heal up like an abscess. (5.) In obstinate cases, especially if the cyst is much thickened, Mr. Key recommends a puncture to be made, and a few threads of silk to be passed through the sac as a seton. This will create great suppuration and constitutional disturbance for a time, but it will destroy the secreting power of the sac, and effect a radical cure. The less, however, that the sheaths of the *flexors* of the wrist are meddled with, whether by puncture or seton, the better. Mr. Wickham strongly recommends the vapour bath, or local steam bath, as a means of getting rid of thickness and stiffness after these operations. Lastly, any rheumatic or gouty tendency should be corrected by proper medicines.

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* The foregoing cut displays a ganglion formed by the synovial sheath of the flexor tendon of a finger. From the King's College Museum.

XI. ACUTE INFLAMMATION OF BURSÆ is most frequently exemplified in the affection called the *housemaid's knee*,—which is an acute inflammation of the bursa, that intervenes between the patella and skin,—common enough in that class of females, from kneeling on hard damp stones. It causes very great pain, swelling, and fever; it may be distinguished from acute inflammation of the synovial membrane of the knee-joint, by observing that the swelling is very superficial, and in front of the patella, which is obscured by it; whereas in inflammation of the synovial membrane of the knee, the patella is thrown forwards, and the swelling is most prominent at the sides.

Treatment.—Rest, leeches, fomentations, and purgatives; by which if the pain and swelling are not relieved, it must be punctured, and treated as an acute abscess.*

XII. LOOSE CARTILAGES are sometimes formed in the synovial sheaths of the hand and foot. Their origin, symptoms, and treatment are the same as when they are found in joints.

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* Wickham, Cyclopædia Pract. Surg. *Art.* Bursæ.

CHAPTER IV.

OF THE DISEASES AND INJURIES OF THE LYMPHATICS.

I. Acute Inflammation of lymphatic *glands* has already been exemplified when speaking of bubo. The inflamed gland enlarges rapidly, and forms a hard, tense swelling, with great pain and fever. If it suppurate, the matter is formed in the cellular tissue around it, or between it and the skin, and the case proceeds as an acute abscess. This affection may be caused, (1.) By constitutional disorder, like acute abscesses. (2.) By local violence, such as blows or kicks. (3.) By the irritation or absorption of acrid matter from ulcers, venereal or otherwise. (4.) By simple injuries, a clean prick, for instance, in persons whose health is deranged. (5.) By punctures inoculated with some irritant fluid, perhaps from a putrid body.

When the disease arises from ulcers or punctures, the inflammation generally begins in the lymphatic vessels leading to the glands, which appear as red lines under the skin, and feel hard, cordy, and tender.

Inflammation of the lymphatics, when a consequence of dissection wounds, may be distinguished from the diffuse *cellular inflammation* arising from the same cause, (Part iii. chap. ix.) by the simple inflammatory character of the constitutional symptoms. It begins with swelling and festering of the original wound, from which red lines extend up the arm. In trivial cases, these may stop at, or may not even reach, the elbow; and there may be very little or no febrile disturbance. But, in severe cases, the glands in the axilla swell and become exquisitely painful;—there is great fever; the pulse is rapid, full, and hard;—matter is formed; and if it be confined by fasciæ, and not evacuated by art, the nervous system may sink under the excruciating pain, and the patient may die. If the matter is discharged, he recovers his health without much difficulty. A comparison of these symptoms with those of the other affection will readily show their intrinsic difference,—although, as was before said, it is very possible that both may be combined.

Treatment.—Acute inflammation of the lymphatics arising from local injury, from constitutional causes, or from the irritation of ordinary ulcers, must be treated by leeches, fomentations, purgatives, and the other local and general antiphlogistic measures, that require no comment. If it be produced by slight injuries, whether in dissection or otherwise, the original wound should be assiduously fomented, and the bowels should be cleared. If the axillary glands are affected, and the pulse is full and hard, the swelled parts should be covered with leeches and fomentations. Incisions should be made early wherever matter is suspected to exist, or is likely to be formed—and when fever abates, the patient's health should be recruited by tonics and change of air, and care must be taken to prevent the formation of sinuses.

II. Chronic Glandular Tumours may arise from simple chronic inflammation—from sarcomatous transformation—from deposit of scrofulous tubercle, and from scirrhus or other malignant disease.

(1.) *Chronic Inflammation* causes a tender swelling, with aching pain, and slight redness of the skin. It may be caused by any slight irritation in the course of the lymphatics, but is more frequently constitutional.

Treatment.—Repeated leechings, cold lotions, and aperients, followed by alteratives and tonics, and empl. hydrargyri, or ung. iodinii.

(2.) *Glandular sarcoma* consists in the transformation of one or more glands (especially in the neck) into *sarcomatous* or *fibrous* tumours, whose characters and treatment have been before described (p. 198). These are to be distinguished from scrofulous tumours by the circumstance, that one or two glands only are enlarged, and that they grow slowly but steadily;—whereas in scrofula a whole cluster is enlarged, and they are subject to fits of swelling and subsidence, from constitutional changes or atmospheric vicissitudes. From scirrhus and fungus medullaris they may be distinguished by attention to the diagnostic signs of those maladies.

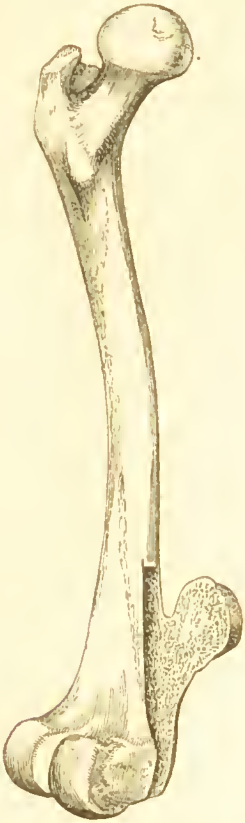
CHAPTER V.

OF THE DISEASES AND INJURIES OF THE BONES.

SECTION I.—OF THE DISEASES DEPENDING ON HYPERTROPHY.

I. Simple hypertrophy.—It sometimes happens that one or more bones increase in length and breadth, without any deviation from their healthy structure. Thus the tibia, or fibula, or femur, has been known to become enlarged and lengthened after some disease which has brought an increased flow of blood to the limb; and the superior maxillary bone has been converted into a solid mass with complete obliteration of the antrum. The deviation from common nutrition on which such enlargements depend, is hardly to be controlled by medicine, although, if any drug is likely to be of service, it is the iodide of potassium.

II. Exostosis signifies a tumour formed by the irregular hypertrophy of bone. Such tumours are hard, painless, and globular, and mostly situated on the upper part of the humerus, or tibia, or on the lower part of the femur, near the insertion of the adductor magnus. Their *shape* is sometimes broad and flat; sometimes rounded and prominent, with a narrow neck. Their *structure* is that of ordinary bone, sometimes dense and compact, especially when they grow from the frontal or temporal bones; sometimes porous in the centre, with a thin external cortex. Sometimes they are preceded by a growth of cartilage or fibrous tissue, which ossifies; sometimes they are bony from the first, and are formed as it were by a development of one particular part of a bone, perhaps a natural process or spine. The adjoining figure is an illustration. They cause no pain, unless they happen to press on nerves or arteries; but they may by their bulk interfere with the functions of various important parts, and give rise to the most serious evils. When situated on the inner surface of the skull, they may cause epilepsy; in the orbit they may cause the eye to protrude on the cheek;—they may obliterate arteries, and impede the action of muscles, and the movements of joints. Sometimes they arise without any very obvious cause; occasionally they originate in a blow, or strain, or in an unnatural degree of pressure on a bone thinly covered by soft parts.



Treatment.—In the first place, an attempt may be made to procure absorption of the tumour by means of blisters, friction with ointment of mercury or iodine, and mercurial plasters. The more recent the tumour, the more effectual such measures are likely to be. Sometimes (especially if the complaint follow a blow) a moderate course of mercury, so as barely to affect the mouth, will be effectual. If these measures do not succeed, the tumour may be removed by operation if requisite on account of the inconvenience it produces. If it is globular, with a narrow neck, it may be cut down upon, and be sawn or chiseled off, or cut off with a gouge. But supposing that its base is broad, so that this cannot be done, its periosteum may be shaved off; after which it will probably perish by necrosis, or else waste away; or the nitric acid, or potassa fusa may be applied to its surface, to cause it to exfoliate. But these operations are not to be undertaken without due forethought; for they may be followed by extensive inflammation and necrosis, or by suppuration into a joint: and in operating on an exostosis near a joint, the possibility of opening the synovial membrane, should always be considered. Exostoses of the clavicles of children almost always disappear of themselves.*

SECTION II.—OF THE DISEASES DEPENDING ON ATROPHY OR DEGENERATION.

I. Atrophy of the bones is marked by a diminution of their weight. Sometimes it is attended likewise by a decrease in bulk; but sometimes, whilst the outward bulk is nearly unaltered, the proper substance is withdrawn, the cortex being reduced to a thin shell, and the cancelli to a few fine threads, with their interstices filled with fat. Atrophy may be caused by simple disuse and want of exercise; by disease of an adjacent joint; by interruption to the supply of arterial blood: (thus after fracture with division of the medullary artery, the lower part of the tibia and femur, and upper part of the humerus may undergo atrophy); by that peculiar defect of nutrition which sometimes affects all the structures of a limb; (vide p. 25, 206), by old age, and by the peculiar state of the system which accompanies rickets and mollities ossium.

II. Rickets, or Rachitis, is a peculiar unhealthy condition of the system attended with atrophy, degeneration, and distortion of some, or many of the bones. They gradually soften, and become infiltrated with a serous or gelatinous fluid, " which becomes organized, and passes into the condition of a moderately firm elastic tissue with minute cells dispersed through it. Accordingly, at this period, the bone consists throughout of a sort of cartilaginous tissue, which will bend without breaking, and through which a knife may be readily passed." Moreover, " besides the diminution of its earthy salts, there is also a change in the animal matter, so that the extract obtained from it by boiling does not yield either chondrine, or the gelatine of bone." * The articular extremities of the bones are often disproportionately large. Of course they are unable to support the weight of the body, without bending and producing deformity. In moderate cases, the ankles only may be a little sunk, or the shins bent, or the spine curved; but in aggravated cases the physiognomy and general appearance are very peculiar. The stature is stunted; the head large, with a protuberant forehead ; but the face is small and triangular, with a very sharp-peaked chin, and projecting teeth; the chest narrow and prominent in front, whence the vulgar term *pigeon-breasted ;*—the spine variously curved; the pelvis small; the promontory of the sacrum and acetabula pressed together, rendering the cavity perilously small for child-bearing; and the limbs crooked, their natural curves being increased. This disorder generally attacks the children of the poor from the second to the tenth or twelfth year of their age. After puberty, it is astonishing how firm the bones become, and, in particular, how they are strengthened by strong ridges developed on their concave sides.

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* Vide Sir A. Cooper on Exostosis, in Cooper and Travers's Surgical Essays; Mayo's Pathology, p. 11; Stanley on Diseases of the Bones, Lond. 1849; T. B. Curling on Atrophy of Bone, Med. Chir. Trans. vol. xx.

Treatment.—The health must be invigorated by pure air, animal food, and the other measures prescribed for scrofula. When a child with crooked legs is brought to the surgeon, he should ascertain whether the deformity arises from relaxation of the joints merely—the bones remaining straight—or from crookedness of the bones themselves. For the knees and ankles may be greatly bent inwards from the former cause, but will become straight of themselves when the health becomes stronger; especially if salt bathing and frictions are used to the legs and back. But if the tibia or femur are actually bent, the surgeon must take care not to tell the parents that the child will *grow out of it ;* for there is no evidence that a bone which has once yielded, can ever recover its primitive shape spontaneously. Therefore some mechanical contrivances should be used, in order both to straighten the bent bones, and to keep them so till they are strong enough to bear the weight of the body; and a pair of simple wooden splints, well padded, and applied with some degree of tightness, from the top of the thigh to the foot, seem to answer every useful purpose, and the child soon learns to walk about in them with his knee straight. They should of course be taken off once daily for a good washing and rubbing.†

III. MOLLITIES OSSIUM (*Malacosteon*) is an extraordinary disease, generally, but not invariably, affecting elderly females, in which the bones become softened and brittle, and lose their earthy constituents. In the very first stage, the affected bones are somewhat softened and extremely vascular. As the disease advances they become somewhat thickened, and so soft as to be easily cut with a knife. On a section being made, the osseous tissue is found nearly absorbed, a mere shell being left, which in most cases is filled with "a dark grumous matter, varying in colour from that of dark blood, to a reddish light liver colour." Under the microscope the Haversian canals are found enormously dilated, and the osseous cells or corpuscles greatly diminished. As the disease advances, the affected bones seem to be reduced to mere thin shells, filled in some cases with serum, in others with fat; whilst in some instances all bony matter whatever has disappeared, and the periosteum has been left as a cylinder filled with a dark fatty substance of the consistence of liver.

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* Stanley, op. cit. p. 218.

† See Bishop on Deformities, Lancet for 1846, vol. i.

The disease is evidently constitutional, and usually affects almost every bone in the skeleton, although two instances have been reported to Mr. Solly, by Mr. Hodgson, of Birmingham, in which it was confined to the lower extremity; and in one of these amputation was performed. At the commencement of it, the patient is observed to be out of health, emaciated, complaining of violent achings in the bones, and of very great feebleness and profuse perspirations. Then from a fall or some other slight injury, a bone breaks;—perhaps it unites again—but afterwards bone after bone breaks from the slightest cause; the weakness increases, and the patient becomes bedridden; and now, as the bones bend or break from the slightest influences, the chest and limbs become distorted to an almost inconceivable degree, and death at last occurs from exhaustion, or from the obstacle which the distorted ribs oppose to the action of the lungs.

Of the *causes* of this disease, nothing is known, and of its *real nature*, just as little. It is evidently, however, as Mr. Solly justly observes, not a *mere atrophy*. The extreme vascularity of the bones in the earlier stages of the affection, and the severe pain attending it, sufficiently show that their vital condition is seriously, though inexplicably altered. That the urine is loaded with phosphate of lime, which in one of Mr. Solly's cases formed a renal calculus, is an interesting and intelligible point in the history of this disease. No available *treatment* is known, beyond common measures for supporting the strength and allaying pain.*

SECTION III.—OF NEURALGIA IN BONE.

The bones, like other parts, are subject to that severe and continuous pain, unaccompanied by inflammation, or other organic change, which is known by the name neuralgia. The patients are generally women, the part affected the condyles of the femur, or the head of the tibia or humerus. The characters which distinguish neuralgic pain have been already briefly described (p. 27) and will be further treated of in the Chapter on Diseases of the Nerves; but one of the most useful practical marks of distinction is, the utter impossibility of procuring relief from those measures, which commonly relieve inflammation.

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* Vide a remarkable case of softness of the bones, by Mr. H. Thompson, Med. Obs. and Injuries, vol. v. 1776; (the urine deposited a copious mortar-like sediment); and an interesting paper by Mr. Solly, containing the details of two cases, Med. Chir. Trans. vol. xxvii.

SECTION IV.—OF THE INFLAMMATORY DISEASES OF BONE.

I. Inflammation produces in bone the same changes that it does in the soft parts. In its slighter degrees it causes swelling from enlargement of the channels which contain the blood-vessels, and from an opening out and greater porosity of the texture, which is its earliest effect. This may be followed, in protracted chronic inflammations, by the filling up of the expanded channels of the enlarged bone, so that instead of being enlarged and porous, it is enlarged and denser than natural. Severer degrees of inflammation may cause suppuration, softening, ulceration, and mortification.

II. Acute Inflammation of bone most frequently attacks the femur or tibia in children, and is usually attributed to cold. It frequently affects more than one bone, but is generally confined to the shafts, and does not often involve the articular extremities.

Symptoms.—The patient is seized with violent shivering and fever, and with deep-seated severe pain, and great swelling of the affected limb, the skin of which displays a kind of erysipelatous redness. Matter soon forms, burrows among the muscles, and at last points in several places. Sometimes the patient is destroyed by the violence of the constitutional derangement, or sinks under the profuse suppuration that follows; but more frequently life is preserved, and the bone left in a state of *necrosis*. On examination of cases that have proved fatal, or that have been subjected to amputation, the shaft of the bone is generally found separated from the epiphyses, and partially or entirely separated from its periosteum; and patches of newly formed bone are deposited upon its surface, and between the layers of the periosteum.

Diffused Abscess. — In some instances the medullary tube and cancelli of the bone are found filled with pus. This is apt to happen after amputation and compound fracture, and to be accompanied with phlebitis and pyohæmia. Sometimes, however, it is induced by cold or bruises, without a wound. It may be suspected when an entire bone is necrosed, including its articular extremities, which usually escape in common inflammation, although the shaft perishes.

Treatment.—Aperient and febrifuge medicines, calomel and opium, with leeches and fomentation, should be assiduously employed at first. As soon as fluctuation can be detected anywhere, an opening should be made; and it is better to do so too soon than too late. When a free exit is provided for the matter, a bandage should be applied to prevent its accumulation. If the patient seem likely to sink, in spite of tonics and nutriment, from the extreme discharge, the affected limb must be amputated.

III. Chronic Inflammation of bone is most frequently the result of some constitutional disorder, and generally attacks several bones simultaneously. It is denoted by slow enlargement, tenderness, weight, and pain. If caused by injury, it may lead to necrosis; but in general it produces no organic change, save irregular enlargement.

Treatment.—The general health should be improved by change of air, alteratives, and tonics, especially Plummer's pill, or hyd. c. creta, in small doses at night, F. 63, 64, and the iodide of potassium, with sarsaparilla. Of the iodide of potassium, Mr. Stanley observes that it never fails to assist in the removal of inflammation from bone, especially when the periosteum or medullary membrane is involved. He is in favour of small or moderate doses, such as gr. ii.—iii. thrice daily. F. 94, &c. The local measures are, repeated leechings and fomentations, so long as there is tenderness or much pain; with Scott's ointment, F. 160, or blisters or *iodine paint* subsequently.

IV. INFLAMMATION OF THE PERIOSTEUM (or PERIOSTITIS) generally occurs on the subcutaneous aspect of thinly-covered bones; especially the tibia, ulna, clavicles, and cranium. Its chief causes are, 1st. a *syphilitic* taint, in which case it produces oval swellings, called *nodes*, through an infiltration of lymph and serum into the periosteum, or between it and the bone. 2ndly. *Rheumatism*, especially in persons who have taken mercury to excess. 3rdly. *Scrofula*. In the latter two cases there is usually produced a swelling of the periosteum of the entire circumference of one or more bones. The scrofulous form attacks children, and is accompanied with remarkably little pain.

If acute or mismanaged, periostitis may lead to suppuration, and caries or exfoliation; but more frequently it causes merely a superficial deposit of bone, or an expansion of the surface of the bone. Periostitis occurring near a joint, is apt to involve the synovial membrane.

Treatment.—For the acute, leeches, fomentations, purgatives, diaphoretics, and colchicum in doses of ℳ xx. of the wine every six hours; or gr. iii. of the iodide of potassium at the same interval. Calomel may be given in doses of gr. ii., with half a grain of opium every night, if the constitution has not been injured by any previous profuse administration of it; and sometimes the disease will yield to nothing but the full influence of mercury, even although the system has been enfeebled by repeated courses. For the chronic, the same treatment as for chronic inflammation of bone. The severe nightly pain is, after the application of leeches, best relieved by renewed blisters. An incision is sometimes necessary if there is a collection of fluid between the periosteum and bone, and no measures succeed in producing its absorption and allaying the pain; but it very often happens, especially in venereal cases, that mercury (if not previously administered to excess), or the iodide of potassium, sarsaparilla, and blisters, will accomplish those objects. A free incision through the thickened periosteum down to the enlarged surface of the bone, is an heroic remedy, and may succeed in relieving pain and tension, and disengorging the distended blood-vessels, after all other remedies have failed. The scrofulous form admits of only palliative and constitutional treatment. *Vide*, p. 96.

V. ABSCESS is a rare consequence of inflammation of bone. A cavity lined with a vascular membrane, and filled with pus, is formed in the substance of a bone, generally the tibia, which may or may not be unusually dense around it. There may possibly be a small piece of necrosed bone confined in the cavity, or the disease may have begun from a deposit of tubercle. Abscess may be suspected when, in addition to permanent inflammatory enlargement and tenderness (which may have lasted for years), there is a fixed tensive pain at one particular spot, aggravated at night, and unrelieved by any remedy, though perhaps it may have occasional remissions. The two affections that are most likely to be confounded with it, are neuralgia, and chronic inflammation.

Treatment.—When there is good reason to suspect the existence of abscess, the bone must be laid bare by a crucial incision, and an opening be made with a trephine at the precise seat of the pain; it may, if necessary, be deepened with a chisel. After the pus is evacuated, the wound must be left to granulate and cicatrize.*

VI.—NECROSIS.—This term, although signifying the death or mortification of bone generically, is yet usually restricted to one form,—in which part of the shaft of a cylindrical bone dies, and is enclosed in a case of new bone. The term *exfoliation* signifies necrosis of a thin superficial layer, which is not encased in any shell of new bone.

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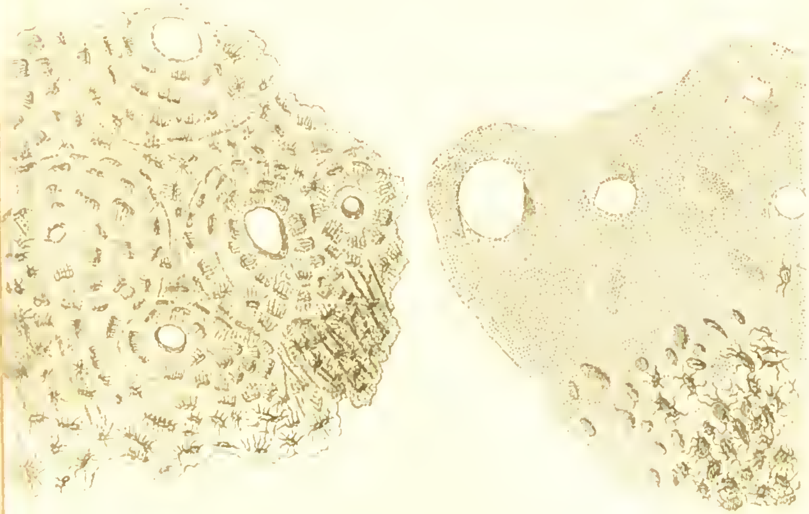
* Vide Sir B. Brodie's Lecture, Med. Gaz., Dec. 1845; Mayo and Stanley. op. cit.

1. NECROSIS is a frequent consequence of inflammation of the shafts of long bones in children, especially of the femur and tibia. It more frequently attacks bones or parts of bones of compact tissue, than of spongy. Yet sometimes a small portion of the cancellous tissue in the centre of the head of a long bone becomes necrosed, with great detriment to the neighbouring joint. Necrosis of the lower jaw from the fumes of lucifer matches, will be noticed in the Chapter on Diseases of the Face and Mouth.

Pathology.—The bone dies; but its periosteum and the surrounding cellular tissue, if healthy, together with the articular extremities of the bone, and its medullary membrane—any contiguous healthy parts in fact—effuse lymph, which speedily ossifies, forming a new shell around the dead portion, and adhering to the living bone above and below it. The dead portion (technically called the *sequestrum*) generally consists of the circumference of the shaft only, and not of the entire thickness; for the interior of the shaft seems to be atrophied and absorbed after the death of the exterior. The inside of the sequestrum is usually rough, as if worm-eaten. In the majority of cases the *epiphyses*, or articular extremities, are fortunately unaffected. After a time, if the *sequestrum* is removed by art or accident, the newly-formed shell contracts, its cavity is abolished, and it gradually assumes the shape and function of the former bone.



Microscopical appearances of Diseased Bone.—Healthy bone, when a thin section is examined under the microscope, is shown to consist of an obscurely granular substance, arranged in concentric laminæ around longitudinal canals (viz. the Haversian canals which contain the nutrient blood-vessels). The laminæ are separated by circular rows of minute cavities or cells, having fine canaliculi running from them, as shown in the preceding figure. In diseased bone, the only changes that have been recognised are variations of *plus* and *minus*;—that is to say, in bone that is condensed and hardened by inflammation, the Haversian canals are small, the laminæ well defined, and the cells numerous. In bone, on the contrary, that is loosened out and rendered spongy, and that has its visible cancelli enlarged under disease, the Haversian canals are seen under the microscope to be greatly enlarged, and the bone cells and laminæ disappear. This is the case in caries, and in that part of the bone where the chink of separation is situated in necrosis or exfoliation, as shown in the next figure. In mollities ossium the bone cells are enlarged, according to Mr. Dalrymple.*

Absorption of Bone.—The mechanism by which dead bone is separated from living, has afforded materials for ample discussion. What is known positively on the subject may perhaps be comprised under these three heads. 1. All evidence is against the supposition that *dead* bone can be absorbed, or can be dissolved by pus. † The honeycombed appearance of sequestra does not arise from an absorption of any part of the bone after its death, but from changes which occurred in it before its vitality ceased. 2. There is no evidence that bone is removed by the lymphatic or absorbent vessels. 3. Bone, to be absorbed, *must possess vitality*, and must be *in contact with a highly vascular structure.*

And thus the separation of a portion of dead bone is produced by the absorption of that layer of the living bone which is nearest to it; which absorption is effected by means of a vascular production resembling ordinary granulations. Under the microscope, the Haversian canals are seen to be enlarged. And to the naked eye, the cancelli are enlarged (see the next figure), so that (to use Miescher's words) "a sort of *diploë* is produced, the cells of which are filled with a soft reddish substance. The walls of the cells become daily thinner and thinner, till at length the living and dead bone are no longer connected by bony substance;"‡ and when the dead part is removed, the living appears covered with a layer of highly vascular granulation, through whose agency the living bone has no doubt been absorbed, although we cannot believe that it has the power of absorbing the dead.§

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* Vide Dalrymple on the Microscopical Characters of Mollities Ossium, quoted in Lancet, Sept. 19, 1846.

† For ample proof of this, see Mr. Gulliver's paper in Med. Chir. Trans. vol. xxi.

‡ Miescher, quoted in South's Chelius, vol. i. p. 692.

§ For the fullest information on the structure of healthy bone, refer to Mr. Tomes's paper on Osseous Tissue in Dr. Todd's Cyclopædia of Anatomy and Physiology, and to his Lectures on Dental Physiology and Surgery in the Lond. Med. Gaz. vol. xxxvii. The author has to thank Mr. Tomes for the three drawings which illustrate this subject, as well as for very much useful information.

Symptoms of Necrosis.—After acute inflammation, the bone remains permanently swelled ; and the apertures which were made for the discharge of matter, remain as sinuses, from which many sensitive, irritable granulations shoot. These sinuous apertures in the skin correspond to holes in the shell of new bone (technically called *cloacæ*) ;—and if a probe be passed into them, the *sequestrum* may be felt loose in the interior ; or at least the probe will strike against dead bone.

Treatment.—The indication is to remove the *sequestrum.* Any hope of its being absorbed or extruded by any natural process, is quite nugatory ; and to permit it to remain, is but to condemn the patient to a perpetuance of disease and deformity. As soon, therefore, as the shell of new bone is sufficiently strong, a free incision should be made so as to expose its surface, and it should be made at a part where *cloacæ* exist, or where the bone is nearest the skin. Then the new shell must be perforated with the trephine, or with Hey's saw, or with a pair of strong bone forceps ;—and the sequestrum must be drawn out. If it cannot be extracted entire, it should be divided with strong forceps, and each portion be extracted separately. If the sequestrum be small, or the cloacæ large, the former may perhaps be extracted without any cutting operation ; and one way of enlarging the cloacæ is to dilate the sinuses in the skin, and keep them open with tents of lint. Mr. Stanley directs that as little as possible of the new bony shell should be removed, because it might not be replaced, and the bone be left too weak to be useful. Necrosis of the articular extremities of bones, or of the tarsus or carpus, generally causes irreparable disease of the neighbouring joints, and requires amputation.

2. Exfoliation signifies the mortification and separation of a superficial layer of bone, or of the extremity of a bone—of a phalanx, or of the end of a bone after amputation, without the formation of a shell of new bone, for example, as in necrosis. It is generally caused by some mechanical or chemical injury, or by stripping off the periosteum. Not, however, that stripping off the periosteum is invariably followed by exfoliation ; for the bone may remain red and moist, and throw out granulations ; whereas if it be about to exfoliate, it becomes white and dry.

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Treatment.—A lotion of weak nitric acid may be useful ; and the exfoliating portion should be removed as soon as it can be detached.

VII. Caries is an unhealthy inflammation of bone which first produces *softening*, and then leads to ulceration and suppuration.

Pathology.—The bone is soft and red; its cells are filled with a red serous or thick glairy fluid, and with soft granulations ;—and in scrofulous cases there is also a deposit of more or less tubercular matter. After a time suppuration occurs; an abscess breaks, and the carious portion of the bone, already softened and spongy, gradually perishes in minute scales, which are thrown off and discharged with the pus. The bone, when macerated and dried, looks soft and spongy; eaten into hollows, and thrown into irregular elevations; the latter marking the site of granulations, and of attempts at reparation.

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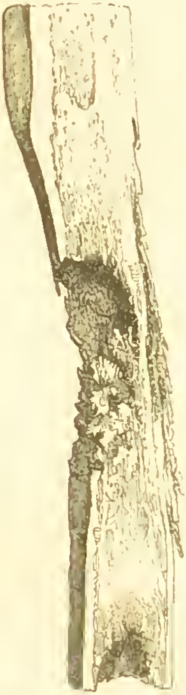
* This cut shows the extremity of the phalanx in the act of separation by exfoliation. At the part where the separation is to occur, the cancelli are seen to be enlarged, so as to form a kind of *diploë,* and their walls are thin.



Symptoms.—"The external character of the limb," says Mayo, "is the same in necrosis and caries. The bone appears enlarged, and one or more sinuses open from it at points that are soft, and red, and sunken." If a probe is passed into these, it will readily break down the softened texture of the carious bone, which yields a gritty feel.

Causes.—Caries most frequently attacks bones of a soft, spongy texture; such as the vertebræ, the round and flat bones, and the articular extremities of long bones. Its genuine cause is some constitutional disorder, scrofula, syphilis, or mercury.

Treatment.—The indications are two-fold;—to rectify constitutional disorder, and to remove the local disease. The former object must be accomplished by change of air, tonics, and alteratives, and the measures that have been directed for scrofula and syphilis, supposing the caries to be connected with those maladies.

If it can be done, the best local remedy consists in freely exposing and removing the whole of the diseased portion of bone by the saw, or gouge, or trephine. If this cannot be done, lotions of the dilute nitric or phosphoric acids may be tried. Caries of the articular extremities of bones will be considered together with diseases of the joints.

SECTION V.—OF TUMOURS, AND ADVENTITIOUS GROWTHS IN BONE.

Of the various tumours of bone, those which depend on an hypertrophy of its normal structure (as the *exostosis*) or on the enlargements incident upon inflammation and its consequences, have been described in the preceding paragraphs.

I. Tumours from Extravasated Blood.—Mr. Travers[*] describes a case in which, after a blow, the clavicle enlarged into a firm oval elastic tumour; which, when punctured by a grooved needle, yielded a few drops of dark grumous blood. The whole bone was extirpated. On examination, it was proved that the tumour had evidently originated in a rupture of the vessels of the bone, and an extravasation of blood into the cancelli. By the pressure of this blood, and a continuance of the extravasation, the bony tissue was expanded and absorbed; and the cancelli were converted into chambers filled with dark solid coagula. The tumour was invested by the periosteum.

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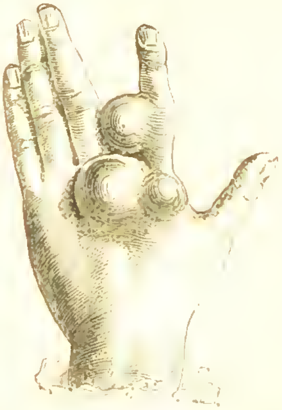
[*] Med. Chir. Trans. vol. xxi.

II. PULSATING TUMOURS are sometimes developed in bone, and may be of three kinds. 1st, *Malignant tumours*, the circulation through which is so energetic, that they pulsate and yield a whizzing sound like that heard in aneurisms. 2ndly, Tumours formed by the development of *erectile tissue* in the substance of a bone; and, 3rdly, Tumours depending on enlargement of the osseous arteries.* To the last, the name of *osteo-aneurism* is given. The seat of the tumour is generally the extremity of one of the long bones, and frequently the tibia just below the knee. The patient complains of a sudden pain in the part. This is followed by painful swelling, and all the veins of the leg are observed to be very tense and full. After a time, the whole limb becomes dark, red, and painful; and the tumour becomes distinctly pulsatory. It is generally moderately firm to the touch, and perhaps gives a slight crackling sensation, owing to the thin shell of bone covering some part of it. On examination it is found to be composed of a spongy tissue, containing convoluted vessels and cells, the latter filled with clots of blood in concentric layers; the bone of course expanded, thinned, and absorbed. This disease has also been observed in the humerus, radius, femur, and ilium. Ligature of the main arterial trunk of the limb, or amputation, are the only remedies.

III. ENCHONDROMA.—*Cartilaginous exostosis, osteo-sarcoma* (Müller). A firm spheroidal tumour consisting of masses of true cartilage imbedded in a fibro-membranous cellular structure. When boiled it yields the variety of gelatine termed *chondrine*. It may be developed in the centre of a bone, or on its surface. In the former case, it causes the bone to expand and be absorbed before it, till at last it is covered by a mere shell. This tumour ordinarily affects only one bone, very frequently one of the fingers or toes; and is occasionally found in the glands, especially



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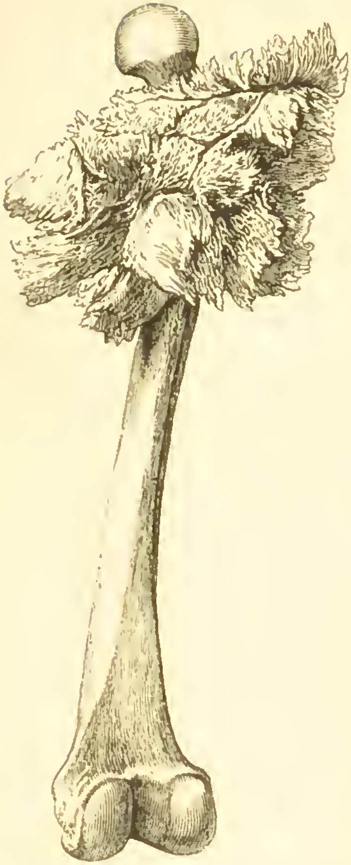
* Stanley, Med. Chir. Trans. vol. xxviii.; Breschet *sur des Tumeurs Sanguines.*



the parotid. Sometimes it tends to ossify, either into one solid tumour, or else a light skeleton of thin papery plates is diffused through it, of which the annexed cut affords an example. In other cases it tends to soften down into a substance much resembling *colloid.* It is not malignant, for although incurable, except by extirpation, and although it may soften, ulcerate, and wear out the constitution by the irritation and discharge, still it does not usually return if thoroughly extirpated, and does not affect any internal organs.*

IV. FIBROUS tumour, containing bony spicula, may be developed in the substance, or on the surface of bone, especially of the superior or inferior maxillary.

V. HYDATIDS, or thin cysts, containing a clear water, are occasionally developed in the substance of bone; causing it to expand and form a tumour, the diagnosis of which must be exceedingly difficult, until the part has been laid open by operation. One of the best cases on record was described by Mr. Keate, who treated it successfully by removing as much as possible of the cysts and of the bone containing them, and applying a solution of sulphate of copper to the diseased surface.†

VI. MEDULLARY SARCOMA—(*Fungoid exostosis*)—is perhaps the most frequent malignant disease of bone. "It generally," says Mr. Mayo, "arises in the cancellous structure; it is therefore generally attended with considerable pain, for the growth of the tumour is rapid, and the shell of the bone has to be partly absorbed, partly mechanically forced open from within."

VII. SCIRRHUS in bone is rare, and is generally a concomitant of the disease in the breast, or in some other part. The femur is the bone most frequently affected, and is often fractured in consequence of the atrophy of its proper texture. The deposit does not attain sufficient size to form a tumour.

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* Vide Müller on Tumours, translated by West.

† Vide Mr. Keate's case, Med. Chir. Trans. vol. x.; quoted also in Mayo's Pathology; case of hydatids growing on the tibia and causing absorption of the bone and fracture, in Wickham on Diseases of Joints; and case of hydatids in bones of pelvis, Med. Gaz. vol. xxx. p. 990.

VIII. Melanosis and Gelatiniform Cancer have also been occasionally found in bone.

IX. Osteoid Tumour (*Malignant, or Ivory Exostosis*). This rare disease consists of a bony tumour, either, says Mr. Stanley, of a yellow ivory-like texture, or of a dull white chalk-like substance, which can be scraped or rubbed into a powder. This osseous substance is united to a soft fibrous tissue, which forms its envelope and fills its interstices. It is generally situated in the lower part of the femur, or head of the tibia, and it generally forms an oblong, rather than a globular tumour. This disease is attended with morbid cachexia, like the cancerous; it tends to implicate the adjacent absorbent glands, which become converted into similar bony tumours; the lungs are likewise invaded with the same morbid growth.

The chief points which distinguish the malignant from the non-malignant tumours, are, their greater rapidity of growth; the greater pain with which they are accompanied; their greater softness at some points than at others; their tendency to involve and become blended with the skin and other adjacent tissues (a sure characteristic of malignant growths); and the existence of the malignant cachexia. But as it is often impossible to distinguish these two classes of tumours from each other, or from inflammatory enlargements, it is satisfactory to know that the early treatment of them all is the same. The same measures that will cure the curable affections will check the incurable. They are, repeated leeching, iodine paint, mercurial alteratives, sarsaparilla, with the iodide of potassium, and change of air and other general tonics. If these measures fail, the only course is amputation or extirpation; which may be performed with confidence of a cure as regards the non-malignant growths. But the extirpation of truly malignant growths, to be effectual, should be very early, and very complete, a partial removal being, to use Mr. Liston's words, an "unmeaning and utterly useless cruelty." *

SECTION VI.—OF FRACTURE GENERALLY.

The term *fracture*, with its varieties, simple and compound, transverse, oblique, and comminuted, requires no definition.

Exciting Causes.—The exciting causes of fracture are two: mechanical violence, and muscular action. Mechanical violence may be *direct* or *indirect*. It is said to be *direct*, when it produces a fracture at the part to which it is actually applied; as in the instance of fracture of the skull from a violent blow. It is said to be *indirect*, when a force is applied to two parts of a bone, which gives way between. This is exemplified in the case of fracture of the clavicle from a fall on the shoulder. The sternal end of the bone is impelled by the weight of the body, and the acromial end by the object it falls against; and the bone, acted upon by these two forces, gives way in the middle. Sometimes fracture is *partial*, part of the fibres only breaking, and the rest bending.

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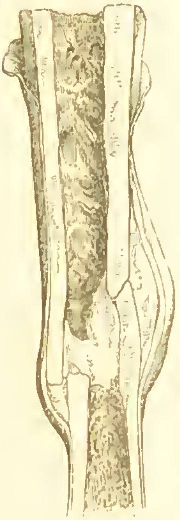
* Vide Walshe, op. cit.; Liston on Tumours of Mouth and Jaws, Med. Chir. Trans. vol. xx.; Stanley on Diseases of Bone, p. 141.

The bones most commonly fractured by muscular action are the patella and olecranon; but the humerus, femur, or any other bone, may give way from this cause, if preternaturally weak.

PREDISPOSING CAUSES.—There are certain circumstances which render the bones more liable than usual to be broken. These are 1. The atrophy arising from old age, or from prolonged disuse of any limb. 2. Certain diseases, as *mollities ossium* and *cancer*. 3. *Original Conformation*; the bones of some people being exceedingly brittle, without any assignable cause.

REPARATION.—The first week, after fracture, is a period of repose; little or no change taking place, except the effusion of small quantities of lymph and serum, and the dispersion of the blood which has been extravasated in consequence of the injury. After this, lymph is effused between the fragments, and gradually becomes converted into bone: whether it is developed into fibrous tissue before ossifying is doubtful. The ossification of lymph, situated between, and adherent to, the broken fragments, accomplishes, of course, the union of the fracture, which may be completed in a space of time varying from three to eight weeks; the time required being so much the less, in proportion as the patient is younger and healthier, and especially if the fracture is nicely adjusted, and kept at perfect rest.



If the broken ends are accurately adjusted together, the reparative material is simply deposited between them; if not, it fills up angular interspaces and constitutes a hard lump or *callus*, as shown in the adjacent cut.

Bones differ very materially in their powers of reparation after injury. Thus after fracture of the *acromion*, *olecranon*, or *patella*, or of any other bone invested with synovial membrane, the greatest difficulty is experienced in producing bony union, unless the broken parts are kept in the very strictest apposition. Complete fracture of the cervix femoris internal to the capsular ligament can hardly be considered, practically speaking, as susceptible of union; and if portions of the skull be removed, the gap is not filled up.*

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* Some uncertainty still prevails, as to the true doctrine of the reparation of fractures in the human subject. The common doctrine that fractures are first

Symptoms.—The essential symptoms of fracture are three: 1. *Deformity;* such as bending, or shortening, or twisting, of the injured limb. 2. *Preternatural mobility;* one end of the bone moving independently of the other, or one part of it yielding when pressed upon. 3. *Crepitus;* a grating noise heard and felt when the broken ends are rubbed against each other. If the broken parts are displaced, they must be drawn into their natural position, otherwise no crepitus will be detected. In addition to these symptoms, there will be more or less pain, swelling, and helplessness of the injured part, startings and spasms of the muscles, and considerable wide-spreading ecchymosis.

It is important in every case to know the causes which produce displacement and deformity after fracture, because it is necessary to counteract them carefully during the treatment. They are three. 1. *Muscular action;* which produces various degrees of bending, shortening, or twisting in different cases. 2. The weight of the parts below, which, for instance, causes the shoulder to sink downwards, when the clavicle is broken. 3. The original violence which caused the fracture, as when the ossa nasi are driven in.

Treatment.—The general indications for the treatment of fracture, are, to place the fragments in their natural position; and having done so, to maintain them in perfect contact and at perfect rest till they have firmly united.

In the *first* place, the limb must, if possible, be put in a position that will relax the principal muscles that cause displacement. In fracture of the upper end of the radius, for instance, the elbow should be bent to relax the biceps; and in fracture of the olecranon it should be straight, so as to relax the triceps extensor.

Secondly, the fracture must be *reduced* or *set;* that is to say, the broken parts must be adjusted in their natural positions. For this purpose, the upper end of the limb must be held steadily by one assistant, whilst the lower is *extended,* or firmly, but gradually and gently drawn in such a direction as to restore the limb to its proper length and shape; the surgeon, meanwhile, by manipulation with his fingers, placing the fragments in their correct position.

Thirdly, it is usual to bandage the whole of the fractured limb from its extremity. This is done for the double purpose of preventing œdema, and of confining the muscles, that they may not contract and disturb the fracture.

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of all united by a *provisional callus,* that is to say, by a ferrule of new bone encircling both fragments, until direct union takes place between the broken extremities, appears to be true in general only as regards animals, in whom it depends on the constant disturbance they are subjected to, and in the human subject, as regards the rib only, which bone being subject to constant motion, is placed under the same circumstances as the bones of the lower animals. The reason of the indisposition of bones connected with synovial membranes to unite by bone when fractured, is also unknown; difficulty of adaptation is not the only cause. Vide Paget, Lectures on Repair, &c. Med. Gaz. 1849; Stanley, op. cit.; and for an account of the older doctrines, Mayo's Pathology; Sir A. Cooper on Fractures and Dislocations, and B. Cooper, Guy's Hosp. Rep. 1837.

Fourthly, it is necessary to use some mechanical contrivances to keep the limb of its natural length and shape, and prevent any motion at the fractured part. It is usual to employ for this purpose *splints* of wood, carved to the shape of the limb. The surgeon should measure the sound limb which corresponds to the injured one, and select splints that are long enough to rest against the condyles or other projecting points at its extremities. These must be *padded*, and pads are easily made of loose tow or horse-hair wrapped up in pieces of old linen, or of pieces of thick blanket. The splints, when ready, should be firmly bound to the limb, with pieces of old bandage or linen straps and buckles. When the splints are properly put on, so as to keep the broken part immoveable, and prevent muscular spasms, without being too tight, the patient is sure to express himself as unspeakably comforted. The proposal to treat fracture by position only, without some apparatus for preventing movement of the broken part, is simply absurd. Instead of splints it is sufficient in some cases to use pasteboard softened in boiling water, so that it may be accurately adapted, and then allowed to dry and stiffen; or layers of lint and bandage soaked in starch mucilage, which, when dry, form a remarkably light, firm, and unyielding support. This, however, should never be applied till all chance of swelling is over. We think it right also to mention the *straw splints*, made by filling a linen bag of the size of the splint required, with unbroken wheat straw, such as is used in thatching; the straw being cut to the length of the limb, and the open end of the bag then sewn up. This is both splint and pad in one, and may often be of great service in country and military practice.*

The remaining treatment of simple fracture must be conducted on general principles. Cordials, to restore the patient from the shock of the injury; the catheter, if he cannot make water, which is common after fractures of the leg; opiates, to allay pain and muscular twitching; aperients, if they can be given without disturbing the fracture; cold lotion, if agreeable; and leeches and bleeding very rarely indeed, to allay excessive inflammation, must be employed at the discretion of the practitioner.

The apparatus and bandages must be loosened when swelling comes on, and be afterwards tightened sufficiently, to keep the parts steadily in their place; and care must be taken to prevent painful pressure on any particular spot, and to rectify any displacement as soon as it may occur.

If, through mismanagement, a fracture has united crookedly, an attempt may be made to bend the callus, and restore the right shape. Such a proceeding may easily be effected before the fourth week, and it has even been successful at the sixth month.†

HABITUAL DEFORMITY must not be confounded with fracture or dislocation. When a person, who has met with a fall or other accident, is found to have a limb shortened or misshapen, the surgeon should always ask whether or not there was any deformity before the accident; else he may fall into the ridiculous error of treating an old deformity, as if it were a recent injury.

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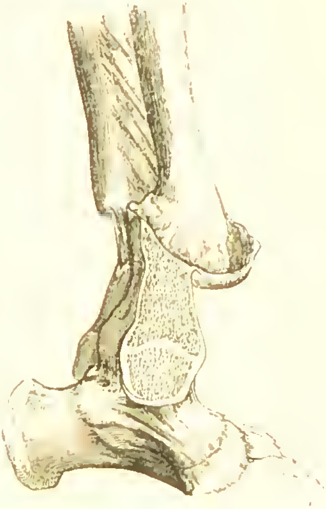
* See some remarks by Mr. Tuffnell, in Ranking's Abstract, vol. iii. p. 240.

† Syme, Ed. Med. and Surg. Jour., Oct. 1838.

SECTION VII.—OF NON-UNION AND FALSE JOINT.

There are some cases in which fracture of the shafts of bones does not unite by bone. This is liable to happen:—

1st. If the fractured part is subjected to frequent motion and disturbance; in which case the effused lymph, instead of ossifying, will either be converted into a ligament which unites the broken extremities, or else a *false joint* will be formed; the ends of the bones being covered with synovial membrane, and surrounded with a ligamentous capsule, as is well shown in the adjoining figure from a preparation in the King's College Museum.



2ndly. The reparative processes may be deficient if the vital powers are exhausted by age and debility; or if the system is under the influence of gout, syphilis, or cancer; or if an acute disease or fever comes on; or if the patient becomes pregnant, and all the nutritive energies of the system are employed in the developement of the fœtus; or if the part be deprived of its nervous influence. Thus Mr. Travers relates a case in which a patient had a fracture of the arm, and of the leg, and likewise an injury of the back, which palsied the lower extremities. The arm united readily enough, but the leg did not. But yet there are some cases which it is as difficult to account for as it is to remedy.

Treatment.—There are three indications: 1st. To bind up the part in splints, or the starched bandages, or to envelope it in a mould of plaster of Paris, so as to insure perfect rest, perfect apposition, and pressure of the broken ends against each other. But, as Sir B. Brodie very justly observes, the bandage should not be put on so tightly as to impede the general circulation of the limb.

2ndly. Should this not succeed, after a fair trial of six weeks or two months, means must be adopted to excite the adhesive inflammation around the fracture. This may be done by rubbing one end of the bone roughly against the other ; or by making the patient walk on the limb, which must be first well supported with splints ; and then the apparatus should be again firmly applied for six or eight weeks.* If this also fail, the next thing to be tried is a seton ; which may be passed through the limb, between the fractured ends ; although it is more safe, and quite as effectual to pass it through the flesh close to the fracture. If, however, there is any difficulty in doing this, the surgeon may cut down on the fracture, by the subcutaneous method, and scarify the ends of the bones by a long narrow knife ; or he may pass in a probe or iron wire between the broken extremities, and allow it to remain a week or ten days, after which the limb should be put up immoveably in splints. If these measures also fail, the last resource is to cut down on the fracture, and saw or shave off the ends of the bone ;—or sometimes it is found that a little piece of muscle is wedged between them, which must be removed ; but this is a most severe and dangerous operation, and not to be resorted to without absolute necessity.

3rdly. Care should be taken to detect and remedy any constitutional disorder to which the want of union can be attributed. Debility must be counteracted by tonics, nutritive food, and stimulants. Mr. Fergusson relates a case of fractured thigh in which no callus was formed for three weeks, until the patient was allowed a reasonable quantity of whiskey, to which he had been previously accustomed ; and Sir B. Brodie relates similar instances. It will be worth while to administer *lime* plentifully, in the form of liquor calcis with sarsaparilla, F. 84 ; or two ounces of lime-water may be given thrice a day, with an equal quantity of milk ; or thirty drops of a concentrated solution of chloride of calcium twice a-day in water.† Mercury may be given if there is a syphilitic taint ; and Mr. B. Cooper gives a case of non-union, in which, although the general health appeared perfectly good, mercury given to ptyalism effected a cure after the seton had failed.‡

A few instances are known in which the callus, after union was completed, inflamed and became absorbed, so that the fracture was disunited again. Leeches and blisters to the part proved effectual remedies.§ A recent callus is also sometimes absorbed during fever; and this occurrence used to be common enough in the sea scurvy.

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* Amesbury, Syllabus of Lectures on Fractures. &c., with plates of apparatus.

† Case of comminuted fracture of humerus, treated successfully by resection of the ends of the bones, by Kennett Hill; quoted in Ranking, vol. x. p. 138, from British Am. Journal, April 1849.

‡ Vide Sir A. Cooper on Dislocations and Fractures, p. 568 ; Brodie, in Med. Gaz. vol. xiii. ; and Fergusson's Practical Surgery, p. 103.

§ James, Address in Prov. Med. Trans. 1840.

SECTION VIII.—OF COMPOUND FRACTURE.

DEFINITION.—A simple fracture may be attended with a wound; but unless the wound communicates with the fracture, the latter is not compound.

CAUSES.—Fracture may be rendered compound. 1. By the same injury which broke the bone. 2. By the bone being thrust through the skin. 3. By subsequent ulceration or sloughing of the integuments.

DANGERS.—These are threefold. 1. The shock and collapse of the injury, which may prove fatal in a few hours, especially if much blood has been lost. 2. Inflammation, fever, and tetanus. 3. Hectic or typhoid fever from excessive suppuration.

QUESTION OF AMPUTATION.—In order to decide upon the necessity of this operation, the extent of the injury and the restorative powers of the patient must be most carefully examined. If the bone is very much shattered and comminuted; if the fracture extends into a joint, especially the knee;—if the soft parts are extensively torn or bruised; if, in particular, the skin has been torn away, so that the wound cannot be closed; or if it is so injured that a large tract of it must slough; if the patient is very old, or much enfeebled, either by previous disease, or present loss of blood; if the collapse of the injury is excessive and permanent; amputation is probably requisite. Of course more may be hazarded with a young patient, or with an old person of a spare, firm habit, who has always been healthy and temperate, than with one who is bloated and plethoric, and in the constant habit of enfeebling his vital powers by over-stimulation and animal indulgence.

Laceration of Arteries is a dangerous complication both of simple and compound fracture. It is detected by the great flow of blood, if there be a wound; and if not, by a rapid, diffused, and dark-coloured tumefaction of the limb, with coldness and want of arterial pulsation in the parts below. If it be the *femoral*, amputation will most probably be required, because the vein may have been injured also; if any other (the anterior or posterior tibial, for instance), it may be secured; provided that there is no other valid cause for amputation, and that the required incision will not too much aggravate the injury to the soft parts. But, *cæteris paribus*, this accident is always an additional reason for amputation, if there be other circumstances rendering it probably expedient.

If amputation be decided on, it must be *primary;* that is, performed before the accession of fever and inflammation, as was observed in the chapter on Gun-shot Wounds.

TREATMENT.—If it be determined to save the limb, it must first be placed in a proper position, and then the fracture must be reduced.

If a sharp end of bone protrude, and it cannot easily be returned or kept in its place, it should be sawn off. Any loose fragments or splinters of bone should be at once removed; and if necessary, the wound may be dilated for this purpose. If suffered to remain, they greatly aggravate the inflammation and danger of tetanus, and may produce long-continued disease of the bone. After reduction, the great object is to produce adhesion of the external wound, so as to convert the compound fracture into a simple one, and the best application is a piece of lint dipped in blood, or in compound tincture of benzoin; then bandages and splints are to be used; but, if possible, the splints should have apertures corresponding to the wound, so that it may be dressed without disturbance to the whole limb. When inflammation and swelling come on, the bandages must be loosened, and cold be applied if agreeable. Pain and restlessness must be relieved by full doses of opium; thirst, by saline draughts, F. 58; and the bowels be opened, if it can be done without disturbance. The catheter should be used if required. But perhaps reaction is not fully established.—"We notice irregular action of the heart; the pulse does not rise as it should do; in the state of sympathetic fever the artery is left sub-dilated, weak, and its beats are fluttering and uncertain; the tongue is coated to a certain degree; the expression of the countenance agitated, and unsteady in its direction; and the sensorium seems faltering in its powers. The patient does not clearly understand his real state, and usually declares that he feels well; he does not sleep much, and is wandering when he does. The wound is dry, and the parts about it assume an ashen colour, with the feel of puffiness in the parts about it."* For this condition brandy and beef-tea are the remedies. The great object in the subsequent treatment is to prevent the lodgment of matter, by sponging and pressing it out carefully at each dressing, syringing with weak zinc lotion, and applying compresses to prevent its accumulation, and, if required, by making openings for its discharge. But if, notwithstanding the employment of tonics, wine, and good diet, the patient seems likely to sink under the discharge and irritation, amputation is the last resource.

SECTION IX.—OF PARTICULAR FRACTURES.

I. FRACTURES OF THE OSSA NASI, AND OF THE MALAR AND SUPERIOR MAXILLARY BONES, may be produced by violent blows or falls on the face, or by gun-shot injuries.

Treatment.—Any displacement of the fractured portions should be rectified as soon as possible, by passing a strong probe or female catheter up the nostril, and by manipulation with the fingers. A depressed fragment may often be conveniently raised by passing one blade of a dressing forceps up the nostril, and applying the other externally, so as to grasp the fragment between them. Some practitioners are in the habit of introducing tubes or plugs of oiled lint, in order to keep the fragments in their places; but this appears to be unnecessary and is very irritating. A plug of lint may, however, be requisite to check profuse hæmorrhage. If the fracture is compound, any *loose* splinters should be carefully removed. The great swelling, ecchymosis, bleeding from the nose, and headache, with which this injury is followed, will require to be combated by bleeding or leeches, purgatives and cold lotions, and spoon diet; and if collections of matter form, they should be opened without delay. If there are symptoms of pressure on the brain, and the vomer seems depressed, it should be carefully drawn forwards, if possible.

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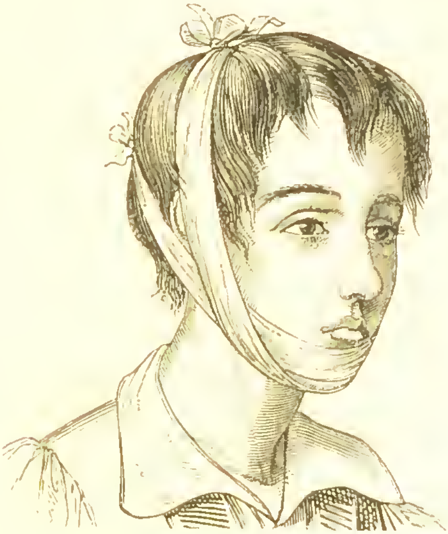
* Vincent, op. cit. p. 127.

II. FRACTURE OF THE LOWER JAW may be caused by violent blows. Its most usual situation, says Mr. Vincent, is at the situation of one of the eye-teeth. Sometimes in children (though rarely) it occurs at the symphysis, and still more rarely at the angle, or in the ascending ramus.

Symptoms.—It is known by pain, swelling, inability to move the jaw, and irregularity of the teeth, because the anterior fragment is generally drawn downwards by the muscles arising from the hyoid bone, whilst the posterior fragment is fixed by the temporal. On moving the chin, whilst the hand is placed on the posterior fragment, crepitus will be felt; and the gums are lacerated and bleeding. The diagnosis of fracture of the *ascending ramus* will often be obscured by the great



swelling. Great pain and difficulty of motion and obscure crepitus are the chief signs.

Treatment, 1*st*, *By the four-tailed bandage.*—A piece of pasteboard, softened in boiling water, should be accurately fitted to the jaw, and then a four-tailed bandage should be applied. This is made by taking a yard and a half of wide roller, and tearing each end longitudinally, so as to leave about eight inches in the middle, which should have a short slit in it. The chin is to be put into this slit, and then two of the tails are to be tied over the crown of the head, so as to fix the lower jaw against the upper, and the other two are to be fastened behind the head. The teeth on either side of the fracture may be fastened together with dentists' silk. The patient should be kept in bed, with his chin bent down on his chest. It is useful to place a thin wedge-shaped piece of cork between the molar teeth on each side, especially if any of the teeth at the fractured part are deficient. Sometimes a tooth falls down between the broken parts; a circumstance which should be looked to, if there is much difficulty in fitting them together.

2*ndly*, *By apparatus.*—If the above simple means do not suffice to keep the fractured parts in contact, Mr. Lonsdale's apparatus should be used; and perhaps it would be well to adopt it in all cases, after the primary swelling and tenderness have subsided. It affords perfect support, and yet allows of free motion.* The patient for the first fortnight must be fed entirely with broth, gruel, bread-pap, &c. The cure generally occupies five or six weeks.

III. FRACTURE OF THE CLAVICLE is most frequently *situated* at the middle of the bone, and it is generally *caused* by falls on the arm or shoulder; sometimes, however, by direct violence, when it is generally situated near the acromial extremity. When fracture of the acromial end of this bone is situated between the coraco-acromial ligaments, there is very little displacement; but when the fracture is external to these ligaments, the acromial extremity of the bone is apt to turn round at right angles to the sternal portion.†

Symptoms.—The patient complains of inability to lift the affected arm, and supports it at the elbow; the shoulder sinks *downwards*, *forwards*, and *inwards*; the distance from the acromion to the sternum is less than it is on the sound side;—and the end of the *sternal* fragment of the bone projects as though it were displaced, although it is not so in reality, but merely appears to be so, in consequence of the sinking of the shoulder and of the outer fragment.

Treatment.—The shoulder must be raised, and must be supported in a direction *upwards*, *backwards*, and *outwards*. The broken parts may be *reduced*, either by putting the knee between the scapulæ and drawing the shoulders backwards; or by placing the elbow close to the trunk and a little forwards, and then pushing it upwards. To support the parts during the cure, the most common apparatus is,

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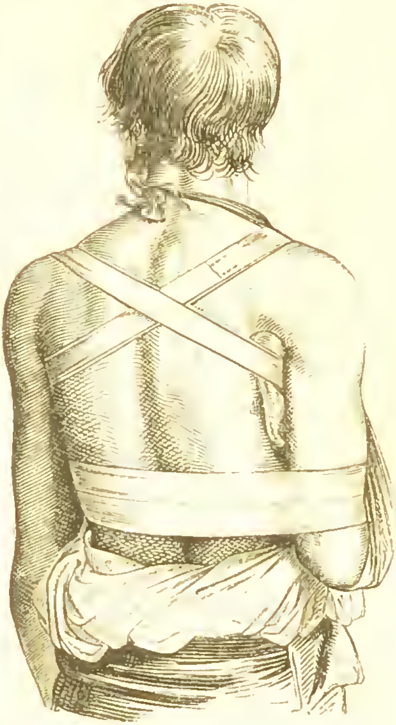
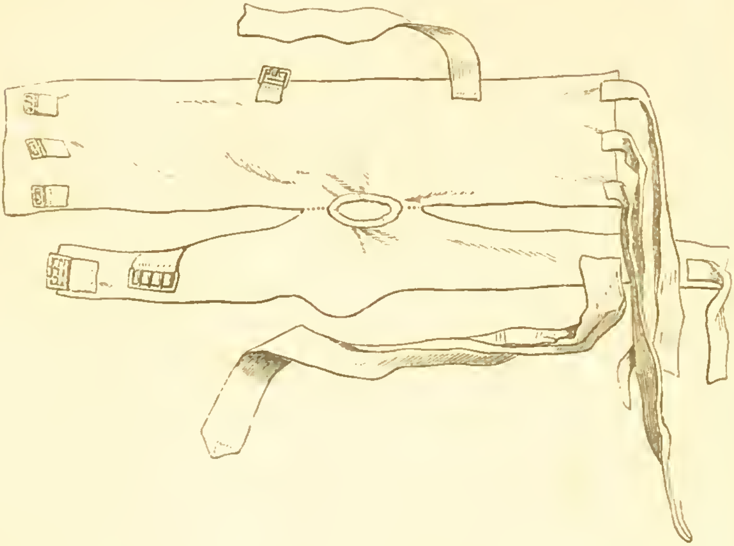
* Lonsdale on Fractures, Lond. 1838. It consists of a grooved plate of ivory to fit the teeth, and a wooden plate adapted to the base of the bone. These two plates are fastened together by screws. See also Fergusson, op. cit. 2nd edit. p. 481.

† A Treatise on Fractures in the vicinity of Joints, by Robert William Smith M.D. &c. Dublin, 1847. A most complete and masterly work.



The *stellate*, or *figure of* 8 *bandage*, represented in the cut. In the first place a thick wedge-shaped pad must be put into the axilla, with the large end uppermost. Then a long roller must be passed over each shoulder alternately, and be made to cross on the back. In the next place, the arm must be confined to the side by two or three turns of the roller; and lastly, the elbow should be well raised by a sling, which is also to support the forearm. It will be noticed, that the shoulder is kept *up* by the sling, *out* by the pad, and *back* by the bandage. The same objects may be gained by means of three handkerchiefs, one to act as the pad in the axilla; another for a sling; and the third to keep the arm close to the body—the whole being stitched together.

Another simple contrivance, invented by Mr. James Duncan for the same purpose, is a strip of *jean* about a yard long, of the shape represented in the next figure. The elbow is fixed in the hole; the smaller straps pass back and front of the chest and are buckled over the opposite shoulder; and the broad part is buckled round the chest, confining the arm to the side. The whole being in one piece cannot slip, and is very available for children. In ordinary cases the patient may be allowed to walk about in a week or ten days, and the cure will be completed in a month or five weeks. The patient should be informed that some little irregularity is apt to remain. If, however, there is any difficulty in maintaining a proper position, the patient must be confined to bed, and some additional apparatus be employed. The simplest is a straight splint across the shoulders, to which they are to be bound by the figure of 8 bandage; or a splint shaped like a T, of which the horizontal part is bound to the shoulders; and the vertical part passes down the back, and is confined by a belt round the abdomen.



Besides these there is the *clavicle bandage*, which consists of two loops for the shoulders, attached to two pads resting on the scapulæ, which are drawn together by straps and buckles; and *Amesbury's apparatus*, which, although very complex, seems constructed in a manner that prevents all possibility of displacement. If nothing else will do, it should be procured at an instrument maker's.[*]

IV. FRACTURES OF THE SCAPULA.—The *body* of this bone may be broken across by great *direct* violence. One case is known also in which it was fractured by muscular action.[†] The symptoms are, great pain in moving the shoulder, and *crepitus;* which may be detected by placing one hand on the acromion or spinous process, and moving the shoulder or the inferior angle with the other.

Treatment.—A roller must be passed round the trunk, and a few turns be made round the humerus, so as to fix the arm to the side, and prevent all motion. Bleeding, or at all events purging and low diet, will be required to avert inflammation of the chest.

FRACTURE OF THE NECK OF THE SCAPULA, by which is meant an oblique fracture, detaching the coracoid process and glenoid cavity from the rest of the bone, is a rare accident, insomuch that some surgeons doubt its existence.[‡]

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[*] Mr. Vincent treats all fractures and dislocations of the clavicle by merely placing the patients on flat beds, by which the parts assume and preserve their natural position. Bandages, he says, do little good commonly, and are not required if the patient keeps his bed. Op. cit.

[†] Quoted in Ranking's Abstract, vol. ii. p. 104.

[‡] Mr. May, of Reading, relates a case of this fracture (Med. Gaz. 8th Oct. 1842).

The *symptoms* described by Sir Astley Cooper are the following: The shoulder appears sunk, and the arm lengthened; the acromion is unusually prominent, and the deltoid dragged down and flattened; the head of the humerus can be felt in the axilla; and on placing one hand or one ear on the acromion, and moving the shoulder, crepitus may be detected. Crepitus may also be felt on pressing the coracoid process, which is situated deep below the clavicle, between the margins of the pectoral and deltoid muscles. The accidents with which this fracture is most likely to be confounded are fracture of the neck of the humerus, and dislocation of the shoulder joint; the symptoms of which should be carefully studied and compared. The existence of crepitus, and the fact that the surgeon can move the shoulder freely (although with great pain), are the chief points of diagnosis between this accident and dislocation.

Treatment.—The shoulder must be supported by the same sling, bandage, and pad that are used for fracture of the clavicle; but a short sling from the axilla of the injured side to the opposite shoulder should be used in addition to the long sling from the elbow to the shoulder. Union may occur in seven weeks. Bleeding, leeches, purgatives, rest in bed, and warm fomentations, will be necessary for the contusion with which this fracture is accompanied.

Fracture of the Acromion is known by a flattening of the shoulder, because the fractured portion is drawn down by the deltoid; and by an evident inequality felt in tracing the spine of the scapula. It may be distinguished from any dislocation, by noticing that the humerus may be freely moved in any direction, and that, on slightly raising the shoulder, the fragment is restored to its place. This is also a rare accident; and Mr. Fergusson believes that, in some of the supposed cases of ligamentous union, the detached portion was never united by ossification to the rest of the bone from birth.

Treatment.—The same bandages, &c. are to be applied as for fracture of the clavicle; but great care must be taken to raise the elbow thoroughly, so that the head of the humerus may be lifted up against the acromion and keep it in its place. Moreover, no pad must be placed in the axilla; otherwise the broken part will be pushed outwards too much. Union is almost always ligamentous, owing to the difficulty of keeping the parts in strict apposition.

Fracture of the Coracoid Process is a rare accident, *caused* by sharp blows on the front of the shoulder.

Symptoms.—The patient is unable to execute the motions performed by the biceps and coracobrachialis; that is, to bring the arm upwards and forwards; and motion and crepitus of the detached process may be felt by pressing with the finger between the pectoralis major and deltoid, whilst the patient coughs or moves his shoulder.

Treatment.—The humerus must be brought forwards and inwards,

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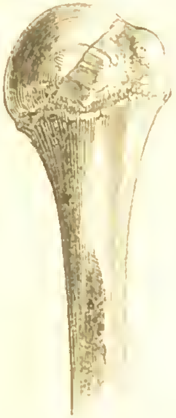
happening to a young lady, and caused by her throwing her necklace over her shoulder. He ascertained that there was no dislocation, and no fracture either of the humerus or clavicle so as to relax the biceps and coracobrachialis, and must be confined to the trunk.

V. FRACTURES OF THE HUMERUS.—*Fracture of the shaft* will be known at a glance by the limb being bent, shortened, and helpless, and by the crepitus felt when it is handled.

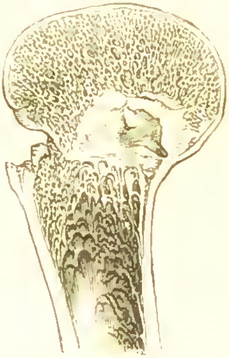
THE UPPER EXTREMITY OF THE HUMERUS may be fractured 1. through the anatomical neck; 2. through the line of junction of the epiphysis; 3. through the surgical neck; 4. the greater tuberosity may be broken off; 5. the head may be dislocated from the glenoid cavity, and the cervix be fractured likewise.



(1.) Fracture *through the anatomical neck*, that is to say, within the capsular ligament, is a rare accident, difficult of diagnosis; there being scarcely any displacement; "The impairment of the motions of the joint and crepitus," says Dr. Smith, "are almost the only symptoms on which we can depend." There is one variety of this fracture in which the detached head of the bone is driven forcibly into and impacted in the reticular tissue of the head of the shaft, between the tubercles, one or other of which is usually broken off. "In this accident," says Dr. Smith, "the arm is slightly shortened, the acromion process projects more than natural, and the shoulder has lost, to a certain extent, its rounded form; the upper extremity of the shaft of the humerus is approximated to the acromion, and the entire of the globular head of the bone cannot be felt. In consequence of the fracture of the tuberosity, crepitus can be readily detected, when the shoulder is grasped with moderate firmness, and the arm rotated. The absence of a rounded tumour in the axilla and the impossibility of feeling the glenoid cavity are sufficient to enable us to distinguish this fracture from luxation."

(2.) Fracture at *the line of junction of the epiphysis*, called by Sir A. Cooper, "fracture through the tubercles, or at the anatomical neck," is a not unfrequent accident in early life, and is usually caused by great and direct violence. *Symptoms.*—The head of the bone can be felt in the glenoid cavity (by which sign this accident is distinguished from dislocation); it remains motionless when the elbow is rotated; there is a striking and abrupt projection situated beneath the coracoid process, and caused by the upper extremity of the shaft of the bone, drawn inwards by the muscles which constitute the folds of the axilla; it may be felt rounded, smooth, and slightly convex, not with the sharp irregular margin of ordinary fracture; a slight extension from the elbow draws the broken point of the bone into its natural place, but it immediately projects again when the extension is discontinued; the axis of the arm is directed downwards, outwards and backwards.

3. Fracture *of the surgical neck* presents nearly the symptoms of the preceding variety;—the head of the bone felt in the glenoid cavity; the elbow capable of being moved by the surgeon in all directions, whilst the head of the bone remains motionless; the projection of the upper end of shaft under the pectoralis muscle; the deformity removed by extension, but returning when the extension is discontinued.



There is one variety of this accident, in which the lower fragment is driven up and impacted in the cancellous tissue of the head of the bone. This complication adds materially to the difficulty of diagnosis, inasmuch as there is some deformity, but yet none of the usual signs of luxation, or of fracture of the neck of the bone. Crepitus may, however, be produced, if the surgeon very firmly grasp the head of the bone, whilst an assistant rotates the elbow.

4. Fracture *of the greater tuberosity* is usually caused by blows or falls on the shoulder. *Symptoms.* Great breadth of the injured joint; slight projection of the acromion and flattening of the deltoid, though the finger cannot be sunk into the glenoid cavity as in a case of dislocation; the head of the bone drawn inwards by the axillary muscles, whilst the separated tuberosity is drawn outwards by the supra and infra spinatus and teres minor; a deep groove can be felt, between the fractured tuberosity and the head of the bone; the latter of which can be felt to move in its socket when the elbow is rotated, and the whole limb can be moved in any direction by the surgeon.

All of the preceding fractures usually unite firmly by bone, even including the fracture of the anatomical neck; for though fracture at this part would seem likely to deprive the head of the bone of all vascular connection and means of support, yet probably some ligamentous bands, which are sufficient for the purpose, remain untorn;—in cases of impaction there is no difficulty. Yet the patient should be informed that some deformity is likely to remain, and some loss of motion, though time and use will go far to restore the latter.

5. In *fracture of the cervix humeri, with dislocation*, the head of the bone can be felt in the axilla, if the arm be raised; and it can be felt not to move when the elbow is rotated. The arm is shortened, and the broken extremity of the shaft can be perceived to move under the acromion. In treating this peculiar form of injury, it is generally found impossible to restore the head of the bone to its place; but the broken summit of the shaft must be brought into the glenoid cavity,

and there be retained by a figure of 8 bandage, and by keeping the humerus close to the side.

Treatment of Fractured Humerus.—In all cases it is advisable that the patient be confined to bed for a week or a fortnight, and particularly if the fracture be at the upper extremity of the bone, which latter accident will probably be followed by great pain and swelling, and require leeches, fomentations or cold lotions, purgatives, and opiates. The hand and forearm must be well and evenly bandaged, to prevent œdema, and the fracture be set, by steadying the shoulder, whilst the elbow is drawn downwards. Next, a long carefully-padded hollow splint should be placed on the inner side of the limb, bearing well against the axilla and the internal condyle; a second on the outer side from the acromion to the outer condyle, and perhaps a third and fourth, shorter, of pasteboard, before and below. These must be fastened by bands of firm webbing, buckled. Then the arm being placed easily by the side,* a firm broad band must be passed round the body, so as to confine the elbow to the side, and a sling put on to relieve the weight of the hand and forearm comfortably, but not to thrust up the elbow.

In all cases the surgeon should take care to have the parts well washed with soap and water, before the splints are put on, and whenever they are shifted; otherwise the confined perspiration may cause an intolerable itching, which tempts the patient at night to loosen the bandages. The maxim "de minimis non curat *lex*" must be reversed as regards the healing art.

When the upper extremity of the bone is the seat of fracture it is often difficult to apply any apparatus that shall tell upon the fragments, prevent deformity, and keep the arm at rest. The author, in such a case, gets a purchase from the opposite axilla, thus: The middle of a long piece of firm webbing is sewn on to the top of the inner splint which is well padded on both sides. This is crossed over the other splint, to the edges of which it is fastened by a strong needle and thread. The ends are then brought, one before, the other behind the neck to the opposite shoulder, where they cross over a large pad, and finally are attached to another large pad under the axilla. This secures the repose of the entire shoulder, if the elbow be properly secured as well. Sometimes instead of the outer splint a firm well-fitting shoulder-cap of leather may be put on, being secured by a strap passing under the opposite axilla, and being likewise buckled round the humerus, close under the axilla. In one case, Mr. Tyrrell was obliged to keep the arm at right angles with the side, by means of a splint like the letter L upside down; and the surgeon's ingenuity will often be taxed to devise means suited for particular cases.

At the expiration of about five weeks the patient may be allowed to swing the arm gently backwards and forwards, and gradually to bring it into use.*

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* In fracture of humerus, just below the insertion of the deltoid. that muscle is apt to make the upper fragment project; but if the surgeon take care that the limb hang easily by the side of the body, this will soon cease.—Vincent, p. 13.

Fracture of the lower extremity of the Humerus may present many varieties. 1. There may be an *oblique fracture above the condyles*;—which usually happens to children. The radius and ulna, with the lower fragment, are drawn upwards and backwards, as in dislocation:—but the natural appearance of the parts is restored by extension. 2. Either *condyle* may be broken off; and the fracture may or may not extend into the joint. 3. There may be one fracture *between the two condyles*, and another separating them both *from the shaft*. All these injuries may be distinguished from dislocation of the elbow by noticing that the motions of the joint are free, and are attended with crepitus above the elbow; and that the length of the fore-arm, measured between the condyles of the humerus and the lower extremities of the radius and ulna, is the same as on the sound side. The patient should be warned that it is very difficult to avoid all deformity and loss of motion.

Treatment.—The fore and upper arm should be bandaged, and a piece of pasteboard, gummed sheeting, or leather softened in water, should be cut to a right angle, like the letter L, so as to fit the elbow when bent, and should be applied on the inner and outer sides, and be retained by another bandage. Besides this, an *angular splint* may be employed. It is composed of two pieces joined at a right angle; one of which is placed behind the upper arm, and the other below the forearm. But if the injury was attended with much violence, the patient must be confined to his bed for some days with the arm on a pillow, and leeches and lotions be employed to reduce the inflammation and swelling.

VI. FRACTURES OF THE FOREARM.—*Fracture of the olecranon* may be *caused* by direct force, or by violent action of the triceps muscle.

Symptoms.—The patient easily bends his limb, but has great pain and inability in straightening it. A hollow is felt at the back of the joint, because the broken part is drawn from half an inch to two inches up the arm; but sometimes, when the ligaments are not torn through, this displacement may be very trifling, or altogether absent.

Treatment.—The limb should be placed in a straight position, and leeches and evaporating lotions be used till swelling and tenderness subside. Then the forearm having been bandaged, the olecranon should be drawn down as much as possible, and the roller, continued from the forearm, should be passed round above it, and then back again about the elbow in a figure of 8 form. Then the whole upper arm should be rolled, in order to prevent contraction of the triceps;

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* Mr. Vincent, op. cit. p. 64, strongly objects to the employment of passive motion, believing that time and the natural action of the muscles will do without any risk all that can be done for the restoration of the motions; whilst passive motion may continue or set up inflammation.

and a splint must be placed in front, so as to keep the arm straight. The patient may be allowed to move the part gently in three weeks. Union will be ligamentous.

Compound fracture of the olecranon is far from an uncommon consequence of violent blows or falls on the elbow; and it is often followed by protracted disease of the joint. The part must be bathed and fomented; any loose fragments of bone be extracted; the wound be closed with bloody lint, or collodion, if the skin can be neatly brought together;—the elbow must be kept straight and motionless with a splint;—leeches and fomentations be used to reduce inflammation; and when the wound is healed, and the joint free from active disease, gentle exercise must be employed to restore it to its proper uses. If the bones are so excessively comminuted as to render it probable that the process of reparation will be tedious and exhausting, excision of the joint should be performed; unless indeed the injury is so very severe as to render amputation indispensable.

Fracture of the Coronoid Process is very rare. It is caused by the action of the brachialis muscle. Mr. Liston gives a case of it which occurred to a boy of eight years old, and was caused by his hanging with one hand from the top of a high wall.

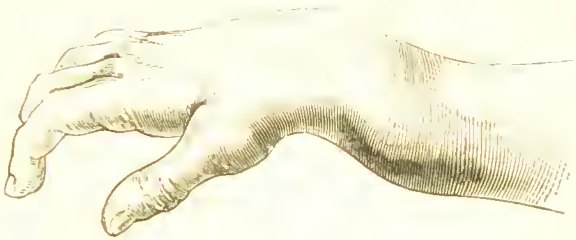
Symptoms.—Difficulty of bending the elbow, and dislocation of the ulna,—the olecranon projecting backwards.

Treatment.—The arm must be bandaged, and kept at rest in the bent position. Union will be ligamentous.

Fractures of the shafts of the Radius and Ulna, together or singly, are known by the ordinary signs of fracture, especially by the crepitus felt on fixing the upper end, and rotating or moving the other. The objects in the treatment are to prevent the fractured ends of either bone from being pressed inwards towards the interosseous space, and to prevent the upper fragment of the radius from being more *supinated* or *everted* than the lower.

Treatment.—The fracture is easily reduced by extension from the wrist and elbow. Then the elbow being bent, and the forearm placed in a position intermediate between pronation and supination (that is to say, with the thumb uppermost), one splint should be applied to the flexor side, from the inner condyle of the humerus to the fingers' ends; and another from the outer condyle of the humerus to the back of the wrist. Both splints should be wide enough, and should be well padded along their middle, so that they may prevent the bones from being pressed together. The hand should be kept in a line with the forearm. The cure is generally complete in a month or five weeks.

Fracture of the lower extremity of the Radius, from half an inch to an inch above the wrist, is now commonly called *Colles's fracture*, from the name of the eminent surgeon who first accurately described it. It deserves careful study from its liability to be mistaken for dislocation. The carpal extremity of the bone is usually broken off transversely, and the fragment is drawn backwards and outwards by the extensors of the thumb and supinator longus. Of course the carpus and metacarpus go along with it. Thus, if the back of the forearm be looked at, there is seen to be an apparent swelling, formed by the carpus and lower fragment; and immediately above this a well-marked sulcus. On the palmar side is a more extensive but less prominent swelling, which seems as if caused by the flexor tendons being thrown forward; this swelling extends about one-third up the forearm, and terminates below at the anterior annular ligaments of the wrist. The extremity of the ulna is seen projecting towards the palm and inner side of the limb; sometimes it is even dislocated forwards. The chief points of distinction between this injury and dislocation, are the facility with which all deformity is removed by grasping the hand and making extension; the return of deformity on ceasing the extension; and the position of the styloid process of the radius, which moves with the hand if the case be fracture, but not if it be dislocation.



Other varieties of fracture at this part are, 1, oblique fracture of the posterior margin of the articular surface of the radius, with partial dislocation of the hand backwards: * 2. Fracture of the lower end of the radius, with displacement forwards: 3. Fracture of both radius and ulna, which may be recognised by attention to the symptoms presented.

Treatment.—The elbow being bent and steadied, the hand should be grasped and powerfully extended, and at the same time somewhat adducted. A pad should be placed along the extensor side of the forearm, and the thickest part of it should correspond to the displaced fragment of the radius, against which it should press so as to push it forwards and somewhat into the prone position as well. Another pad should be placed on the flexor side, but should not reach lower than the margin of the superior fragment. "An anterior and a posterior splint," says Dr. Smith, "are then applied, each of which should be at least an inch broader than the forearm; the posterior should extend from the elbow to the fingers, and should be curved from the wrist downwards to receive the adducted hand; the anterior need not descend below the palm of the hand; a roller is then to be carried around the splints in the usual manner." Three weeks should elapse for a young patient, and four or five for an old one, before the wrist is moved ; and the patient should be informed at first that some months will elapse before the use of the part is restored.

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* Barton, Philadelphia Med. Examiner, No. 7, 1838. The above cut is copied from Dr. Smith's work on Fractures.

VII. FRACTURE OF THE HAND.—The *carpus* is rarely fractured without so much other injury as to render amputation necessary. Fracture of the *metacarpal bones*, or of the *phalanges*, will be readily recognised. With respect to compound fracture of these parts we may observe, that no part of the hand should be amputated unless positively necessary, and even one finger should be saved if it can be done.

Treatment.—For fractures of the carpus, middle metacarpal bones, and first phalanges, it is a good plan to make the patient grasp a ball of tow or some other soft substance, and bind his hand over it ; for fracture of the lateral metacarpal bones, it is better to support the hand on a flat wooden splint, cut into the shape of the thumb and fingers. If one finger only be fractured, it may be confined by a thin lath or pasteboard splint. It must be recollected that the palmar surfaces of the metacarpal and digital bones are concave. They must, therefore, be slightly padded before they are bound to any flat surface, or they will unite crookedly.

VIII. FRACTURES OF THE RIBS is generally situated in their anterior half, and is commonly caused by *direct* violence, such as blows ; the bone giving way at the point struck. Sometimes, however, it is caused by *indirect* violence ; as for instance, when the chest is violently compressed between two points. In 1837 several people were crushed to death in a crowd in the Champ de Mars, in Paris, and many of them were found to have several ribs broken in this manner. Sometimes, in old subjects, one or more ribs are broken by violent coughing.*

Symptoms. — Fixed lancinating pain, aggravated by inspiration, coughing, or any other motion. By tracing the outline of the bone, or by placing the hand or the stethoscope upon it, crepitus may be felt during the act of coughing or inspiration, and the patient is sensible of it likewise. If the fracture be situated near the spine, or if the patient be very corpulent, it may be difficult to detect it with certainty, but this is of little consequence ; for in every case, when a patient complains of pain on inspiration, after a blow on the chest, the treatment is the same.

Treatment.—The indications are, 1. To *diminish motion* of all the ribs, by passing a broad flannel roller, or a towel fastened with tape round the chest, so tightly, that respiration may be performed chiefly by the diaphragm. The bandage should have shoulder-straps to keep it up. The arms should be confined to the side so as to prevent all motion of the scapula, and this latter in fat women is all that can be done; moreover there are some patients who find all bandages intolerable, but who do very well by being kept quiet in bed. 2. To *obviate inflammation* of the chest, and diminish the arterializing duties of the lungs by bleeding (if required), rest in bed, and low diet; to unload the bowels by purgatives, so as to enable the diaphragm to descend freely; and to administer opiates, to prevent pain and cough.

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* See an interesting paper on Fracture of the Ribs, by M. Malgaigne, in the Arch. Gén. de Méd. 1838, quoted in B. and F. Med. Rev. vol. vii. p. 554.

Emphysema, a swelling caused by the presence of air in the cellular tissue, is an occasional complication of this fracture. It is produced in the following way:—The extremities of the fractured rib perforate both *pleuræ* and wound the lung. In the act of inspiration, air escapes from the lung into the cavity of the pleura, and from thence through the wound in the *pleura costalis* into the cellular tissue of the trunk. *Emphysema* forms a soft puffy tumour, that crepitates and disperses on pressure.

Treatment.—"The first object," says Mr. Vincent, "is to adapt a firm bandage over the part of the rib broken, by which the effusion of air into the cellular tissue under the integuments is stopped. The air passing from the wounded lung is now confined to the cavity of the pleura, with which it is filled, compressing the lung. By this means the wound which was made whilst the lung was dilated, is more completely closed than would have been done with any contrivance of art. This wound is usually healed on the eighth day; at that period the breathing greatly improves,"* and the case is soon reduced to one of simple broken rib.—See the Chapter on the Injuries of the Chest.

IX. Fracture of the Sternum. *Symptoms.*—Crepitus may be felt during inspiration or other movements of the trunk, and displacement (if any) can be detected by examination.

Treatment.—The same as for fractured ribs.

X. Fractures of the Pelvis can be caused only by most tremendous violence, and are often attended with some fatal complication;—such as laceration of the bladder or rectum, or of the great arteries or veins.

Treatment.—The only thing to be done is, to place the patient at perfect rest, and in as easy a position as possible; to keep a catheter in the bladder; to make incisions if urine is extravasated into the perineum, as it will be if the urethra is lacerated by fractured portions of the rami of the ischium and pubes, and to treat any symptoms that may arise. If it can be borne, a broad belt may be passed round the pelvis; and another under the nates, which might be attached to a pulley over the bed, so that the patient may raise the pelvis, without exerting any of the muscles attached to it.

There are some cases of fracture of the os innominatum passing through the acetabulum, and caused by falls on the hip, which might be mistaken for fracture of the cervix femoris. For instance, in some cases related by Mr. Earle,† the foot was everted, and there was loss

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* Vincent, op. cit. p. 47.

† Earle on Fractures of the Pelvis, Med. Chir. Trans. vol. xix.; see also case lxxi. in the last edition of Sir A. Cooper on Fractures and Dislocations.

of prominence of the trochanter; but there was no shortening, and the limb could be turned freely outwards, which motion is highly painful after fracture of the neck of the femur. In a case reported by Dr. George D. Gibbs of Montreal, in which the right side of the pelvis was literally smashed, the leg was everted and shortened an inch and a half; the trochanter nearer the anterior superior spinous process than on the sound side. On rotating the limb, the right trochanter appeared to move in the segment of a smaller circle than the left, and crepitus was distinctly felt in the joint. The diagnosis will be aided by the crepitus felt on applying the stethoscope to the ilium, and by examination per anum. It very rarely happens that the acetabulum and cervix femoris are both fractured. The patient must be kept on a fracture-bed. One of Mr. Earle's cases was cured in eight weeks, Dr. Gibbs's in sixteen.*

Fracture of the *os coccygis*, or of the lower extremity of the sacrum, may be caused by violent kicks or falls;—the former may occur during parturition to women who have children after the coccyx is united to the sacrum. The loose portions must be replaced by introducing the finger within the rectum. The patient should keep in bed, and the bowels must be kept relaxed, so that no disturbance may be occasioned by hard stools.

XI. FRACTURES OF THE FEMUR present many varieties, which must be carefully studied; because, as Pott observes, "they so often lame the patient and disgrace the surgeon." We must, therefore, treat separately, 1. of fracture of the neck of the femur internal to the capsular ligament; 2. of fracture of that part external to the capsular ligament; 3. of oblique fracture through the great trochanter; 4. of fracture separating the epiphysis of the trochanter major; 5. of fracture just below the trochanter; 6. of the shaft; 7. of the condyles.

(1.) *Fracture of the cervix femoris internal to the capsule* is generally caused by *indirect violence;* that is, by a slight force acting on the lower extremity of the limb, as happens in slipping off the curbstone; sometimes, however, it is produced by falls or blows on the hip.

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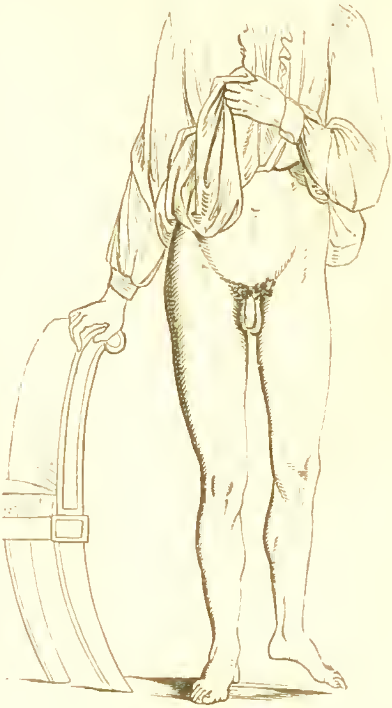
* British American Journal, Sept. 1849.

It is very rare in persons under fifty; but very common in old people, especially old women; because this part of the femur seems to suffer first and chiefly from the atrophy and fatty degeneration which all the bones, more or less, experience in advanced life.*



Symptoms.—After a blow or fall, the patient finds himself unable to stand, and complains of great pain, increased by motion, and principally seated at the upper and inner part of the thigh. The leg is shorter than the other;—the foot turned outwards; — the heel rests in the interval between the ankle and tendo Achillis of the other leg; *crepitus* may be detected if the hand or the stethoscope be placed on the trochanter, whilst the limb is *drawn to its proper length* and rotated. When extension is discontinued the limb shortens again. The trochanter generally projects less than on the other side; and if the foot be rotated by an assistant, it is felt to move in a segment of a lesser circle than natural. The limb may generally be freely moved by the surgeon, although with great pain, especially if it is abducted; but the patient cannot lift it from the bed.

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* It is sometimes stated that the neck of the femur is commonly shortened in old persons, and sunk from the oblique to the horizontal posture; but it is doubtful whether this is the case, except when the joint has been affected with *chronic rheumatic arthritis.* In this disease, which often affects old bedridden persons, the acetabulum is expanded and surrounded with irregular bony growth; the cartilage removed and replaced by porcellaneous deposit; the neck of the femur shortened so that the head is almost in contact with the top of the shaft; the capsule thickened, with irregular growths of bone around it (which have sometimes been mistaken for a misplaced effort of nature to repair a fractured cervix), sometimes at the part where the capsular ligament is inserted, the bony texture is completely absorbed, and its place supplied with a ligamento-cartilaginous substance; appearances which have been mistaken for united fracture. Smith, op. cit.; Edwin Canton's notes on the morbid anatomy of Chronic Rheumatic Arthritis, &c. Reprinted from Med. Gaz. 1848. Roberts, Exeter, 1848.

The above symptoms are liable to considerable diversity arising from accidental variations in the manner in which the fracture occurred. Thus (*a*) the *amount of shortening* (which was stated by Sir A. Cooper at from one to two inches) depends on the degree to which the fibrous investment of the neck is lacerated. If that membrane be not much injured the shortening may be much less than an inch; moreover, it is doubtful, according to Dr. Smith, whether the capsular ligament, if entire, would permit the limb to be drawn upwards for more than an inch. Again, if the fibrous investment of the neck be not torn, or if the fracture be very oblique, so that the upper opposes the ascent of the lower fragment, or if the lower be driven into and impacted in the upper fragment, there may be no immediate shortening at all.

(*b*). The *time at which shortening occurs* may vary. Sometimes it is very slight at first, but becomes very decided in *a few days*, when the muscles doubtless have recovered from the paralyzing effects of the injury. Sometimes, in an obscure case of fracture, the limb retains its natural length for a few days or weeks, and then *suddenly shortens*, whilst the patient is attempting to walk: doubtless because the attempt has caused the laceration of some untorn fibres of the periosteal investment of the cervix, which before held the fractured parts in apposition. In other cases the limb *gradually* shortens to the extent of one or two inches during the six months succeeding the injury. This is owing to interstitial aborption of the neck of the femur.

(*c*). The *position of the limb* is sometimes anomalous; being inverted in a few cases.

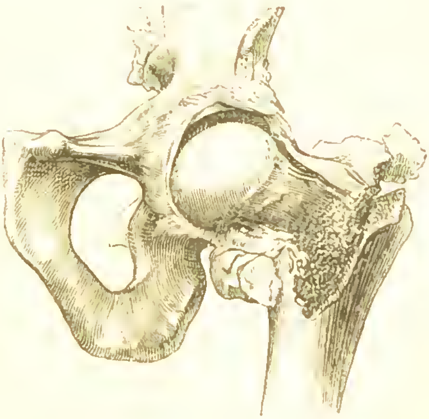
(*d*). In some cases the neck of the bone is driven into, and impacted firmly within the cancellous tissue of the head; a circumstance which of course renders it difficult to say whether the injury be one of fracture or of mere contusion. The chief characters of this injury are those summed up by Dr. Smith. "1. Slight shortening of the limb. 2. Slight eversion of the foot. 3. Absence of crepitus. 4. Great difficulty in all cases, and in the majority an impossibility of removing the shortening of the limb by extension; and, lastly, less loss of power than in other forms of fracture of the neck of the femur."

Prognosis.—This fracture does not unite by bone, except in the rare instances in which the broken surfaces are held closely together by the untorn periosteum, or by impaction; or in which the fracture is partly internal and partly external to the capsular ligament. In such cases there is no doubt that bony union may occur; but in the majority the fracture either unites by ligament, or, more commonly, does not unite at all; but the stump of the cervix becomes rapidly absorbed, rounded, and covered with a smooth porcellaneous deposit, and plays in a socket formed by the hollowing and absorption of the head. The capsular ligament becomes excessively thick, and so does the obturator externus muscle, so as to support the weight of the body. The reason of this non-union is, doubtless, the want of apposition and of pressure of the fractured surfaces against each other; to which may be added the age and debility of the patients; the atrophy of the part injured; the imperfect nourishment of the upper fragment, and the general indisposition of bones covered with synovial membrane to throw out callus.

Diagnosis.—The surgeon should be aware that a fall on the hip is apt to produce interstitial absorption and shortening of the neck of the femur, with disappearance of the cartilage, eburnation of the articular surfaces, and irregular deposit of bone around the cervix (the same series of changes which the part undergoes in chronic rheumatic arthritis) with shortening of the limb, and wasting of the muscles; with most of the conditions, in fact, that follow a fracture. Thus the patient on recovering from the immediate effects of the injury, finding the limb lame and shortened, may accuse the surgeon of having overlooked a dislocation or fracture. Of course the surgeon must defend himself by proving the absence of the symptoms of these injuries immediately after the accident, and by reference to authenticated cases in which the same ill consequences have followed bruises without fracture.*

Treatment.—It is of no use to sacrifice the patient's little remnant of health and strength, and run the risk of producing sloughing of the nates by long confinement to bed, in the hope of procuring union by bone. But he should be kept in bed for a fortnight, till pain and tenderness abate; with one pillow under the whole length of the limb, and another rolled up and placed under the knee. Then he may get up and sit in a high chair, and shortly begin to crawl about with crutches; and in time he will regain a tolerable use of the limb, especially if not very corpulent. The sole of the shoe must be made thick enough to counteract the shortness of the limb. It must be added that this injury often proves fatal during the first three weeks, from the shock to the constitution, or from the bruises inflicted on the limb.

(2.) *Fracture external to the capsular ligament* is caused by direct violence, such as falls or blows on the hip; by which the neck of the femur is broken off, and driven into the cancellous structure of the great trochanter; and at the same time one



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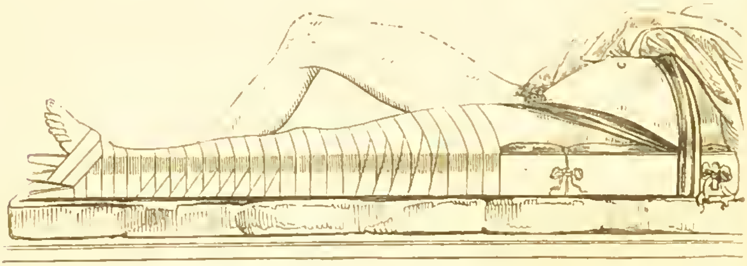
* Smith, op. cit.; Canton, on Interstitial absorption of the Neck of the Femur from Bruise, &c. Med. Gaz., Aug. 11, 1848.

or both trochanters are split through likewise. If the cervix be firmly impacted and the trochanters are still adhering by untorn periosteum, the diagnosis of this fracture presents obvious difficulties ; for there is no crepitus ; the limb is shortened, but yet cannot be brought to its natural length by any justifiable amount of extension, and is not so everted, nor so powerless as is usual in fracture ; yet if the distance of the trochanter from the anterior superior iliac spine be measured, it will be found less than on the opposite side. If, however, this fracture be so comminuted, that the cervix is not impacted in the shaft, the shortening and eversion are well marked, and crepitus can be produced on extension and rotation.

Treatment.—If the patient's age, and strength, and health, admit of the confinement to bed and application of apparatus, an endeavour must be made to procure bony union, and the indications are to *preserve the length of the limb*, and to *keep the great trochanter pressed towards the acetabulum.*

The principal method now employed is that of the *long straight splint.* The common straight splint of Dessault extends from the pelvis to the foot, and has a footboard with straps, &c., at the bottom. But the simple splint employed by Mr. Liston, and depicted in the adjoining cut, is much better. It is a simple deal board, of a hand's breadth for an adult, but narrower and slighter for a young person. It should reach from opposite the nipple to four or five inches below



the foot. At its upper end it has two holes, and at its lower end two deep notches ; with a hollow for the outer ankle. " A pad of corresponding length and breadth is attached by a few pieces of tape ; a roller is split at the end, and having been tied through the openings in the top part of the splint, is unrolled as far as the bottom, where it is fixed for a time. The limb must now be gently extended from foot and pelvis to its proper length, and must be bandaged from the foot to the hip. The splint is next applied to the outside of the limb, and the roller before spoken of must be repeatedly passed round the instep and ankle, and through the notches, so as to secure the foot, and must then be carried up the leg. A perineal band, composed of a large soft handkerchief padded with tow and covered with oiled silk, must be put round the groin, and be fastened firmly to the holes at the top of the splint; and, lastly, a few turns of broad bandage are to be passed round the trunk."*

In order to prevent the galling of the perineal band, and its supposed tendency to draw the fractured parts asunder, Mr. Fergusson had adopted the plan in some cases of making counter-extension from a strong stay of jean, accurately fitted to the upper third of the opposite thigh; from which a band extends back and front to the upper end of the splint. This is very comfortable, and obviates the necessity of the band round the belly, since it draws the splint *towards* the body.

Mr. Fergusson has also devised a modification of the straight splint, which has the merits of cheapness and simplicity, and at the same time seems likely to answer almost every purpose of a splint that can be required in treating fractures of the lower extremity.† It consists of a long iron bar, of the length of the ordinary straight splint; but the upper half of it can be unscrewed and removed, so as to make it a short splint, for fractures below the knee. It has a foot-board, which can be adapted to any length of limb; which can be moved to any distance from the splint, so as to adapt the instrument to the thickness of the patient's leg; can be adapted to any degree of flexion or extension of the ankle joint; and what is of extreme consequence, can be turned inward or outward, so as to rotate the limb on its long axis, and prevent inversion or eversion of the foot. The advantage of this, in treating fractures and dislocations of the ankle, must be obvious.

The *fracture-bed*, a contrivance consisting of four planes, one for the trunk, a second for the thighs, a third for the legs, and a fourth for the feet, each of which can be adjusted to any length, and to any angle with the others, is used by some surgeons, and is not without its advantages.

(3.) *Oblique fracture through the Great Trochanter.*—This accident may occur at any period of life, and is attended with the following symptoms:—The limb is everted, but very little shortened; and the shaft of the bone can be felt widely separated from the trochanter. This fracture unites readily by bone; and the treatment required consists of extension of the limb by the long splint, and a circular girth with a pad, to support the upper extremity of the shaft and keep the broken surfaces in apposition.

(4.) *Fracture of the Epiphysis of the Trochanter Major.*—The trochanter is sometimes broken off from the femur, at the part where it is united by cartilage as in epiphysis in youth. The diagnosis is generally obscure; but we allude to the accident in order that the surgeon may be aware of the possibility of such an occurrence. The part will unite by ligament.

(5.) *Fracture of the Femur just below the Trochanters* is liable to be followed by great deformity and non-union, because the upper fragment is tilted forwards.

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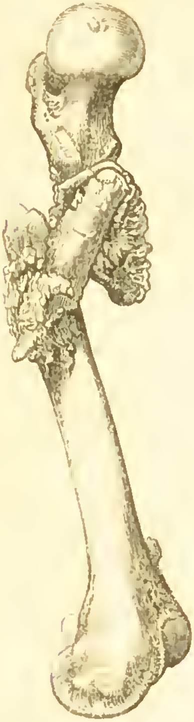
* Liston, op. cit. p. 88.

† It is manufactured by Weiss in the Strand.

Treatment.—If the long splint does not suffice, the best plan is to place the patient on a fracture-bed, in a half-sitting posture, so as to relax the psoas and iliacus muscles.



The accompanying figure shows the influence of the psoas and iliacus in tilting the upper fragment forwards; and of the adductor muscles in drawing the lower fragment upwards and inwards.

(6.) *Fracture of the shaft of the femur* requires no observations as to its causes or *symptoms.*

Treatment. — 1. The first apparatus that we shall notice is the long straight splint before described, whose advantages are, that it keeps the foot, knee, hip, and pelvis immovable.

2. A second plan is that of the *double inclined plane.* It consists of two pieces like the letter A;—one for the thigh, the other for the leg, with a board to fasten the foot to. The whole limb must be bandaged;—the *thigh-piece* must be made accurately to correspond to the distance between the tuber ischii and the bend of the knee;—and then one splint is to be placed from the *great trochanter* to the *outer condyle;*—a second, from the ramus of the pubes to the inner condyle; and a third on the anterior surface of the limb. Perhaps it is a good plan to apply a fourth splint, from the *tuber ischii* to the *bend of the knee*, before placing the patient on the plane. Both legs should be bandaged. The disadvantage of this plan is, that the patient's *bottom* sinks in the bed, and thus the upper fragment is tilted forwards.

3. A third plan is that of Pott.[*] It consists in laying the patient on the affected side, the thigh at right angles to the trunk, and the knee bent—with a many-tailed bandage and four splints, applied between the different points of bone that have just been mentioned. The disadvantages of this plan are, first, that the patient soon turns round on his back, dragging the upper fragment away from its right place; and, secondly, that the pressure on the great trochanter may cause sloughing. The first evil may be prevented simply by watching the patient, and telling him to turn round on his belly rather than on his back, if he wishes to shift his position. The second may be re-

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[*] Pott, Chirurgical Works, vol. i. p. 365.

medied by placing him on his back, at the end of a fortnight, with his knees bent up and supported by pillows.

Every surgeon must determine for himself what mode of treatment to adopt, but must never forget that care and attention are requisite for the success of any plan.

Supposing a case of very oblique fracture of the thigh, with great difficulty in preventing overlapping of the fragments ; it is a good plan to cover the whole limb from the foot to the hip with soap-plaster spread on calico ; then to extend it to its proper length with the pulleys, and to cover it with plaster of Paris ; keeping up the extension till the plaster has become hard.*

If *both thighs* are broken, a fracture-bed should be employed ;—or, if the surgeon has not one, the patient should be placed on his back, with four splints to each thigh, and his knees drawn up, and supported by pillows.

When the *lower end of the femur* is fractured obliquely downwards and forwards, the sharp end of the upper fragment is apt to pierce the extensor muscles, and the lower fragment to be dragged down into the ham by the gastrocnemius.

Treatment.—Firm extension must be kept up with the double inclined plane and splints ;—and the knee must be well bent, to relax the gastrocnemius.

(7.) *Fracture of the Condyle into the knee-joint* mostly happens to old persons, and not unfrequently proves fatal. If much *comminuted*, or if *compound*, *amputation* will be necessary. Otherwise, the limb should be placed *straight*, so that the head of the tibia may keep the fractured parts in their places ; lotions and leeches should be used to prevent inflammation ;—and afterwards a pasteboard splint. *Motion* should be commenced in five weeks.

XII. FRACTURE OF THE PATELLA is generally transverse, and is *caused* by sudden contraction of the extensor muscles attached to it ;—as, for instance, when a person who has his knee much bent under him, and is in danger of falling, tries to save himself by throwing the body forwards.

Symptoms.—Inability to straighten the knee, and separation of the fractured parts, which can be readily felt, and which is increased by bending the knee.

Treatment.—The limb must be laid straight, with a well-padded splint behind the thigh and leg, in order to keep the knee quite motionless ; and the patient's body should be raised to a half-sitting posture, in order to relax the rectus muscle. Evaporating lotions and leeches must be used, till pain and swelling abate ;—then, and not till then, some apparatus may be employed to keep the broken surfaces as nearly in contact as possible. The most common consists of one pad, or strap, or bandage, placed above the patella, and a similar one below it;—the two are then approximated by longitudinal straps, or bandages, passing between them. But the best apparatus conceivable is that invented by Mr. Lonsdale; for it causes no circular constriction of the limb whatever. If the parts can be kept in *complete apposition*, the union may be bony;—if not, it will be ligamentous; it is, however, a great object to have the ligament as short as possible. In five or six weeks the patient should sit on the edge of a high table, and swing his leg backwards and forwards.

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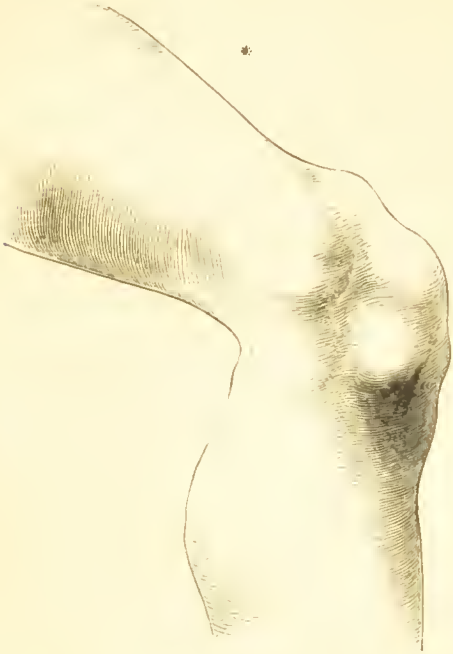
* A case treated in this way by Mr. Bond, of Glastonbury, will be found in Sir A. Cooper on Dislocations, p. 191.



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Longitudinal or *comminuted* fracture of this bone is always caused by direct violence, and attended with great inflammation,—which being subdued, the parts must be kept in their places by bandages and pasteboard splints. *Compound* fracture will generally require amputation; unless the *wound is very small*, the skin is not injured enough to slough or ulcerate, and the constitution very good.

XIII. Fractures of the Leg.—The ordinary fractures of the leg may be readily distinguished by careful examination. There are several methods of treatment.

(1.) *By the common splints.*—The injured leg being laid on its outer side, the fracture is reduced by extension from the knee and ankle. Then a many-tailed bandage is applied by some surgeons after the manner represented in the cut. This bandage is easily made thus:—take a piece of roller, long enough to reach from the knee to the foot, and to overlap about one-third of the leg besides. Cut another roller into pieces, and lay them across the first at right angles, in such a manner that each shall overlap one-third of the preceding one; these transverse pieces (which should be half as long again as the circumference of that part of the leg which they are to encircle) are to be stitched to the longitudinal one, and then the bandage is ready for use. One splint, well padded, should be applied to the outer side of the limb; another to the inner side; and if there is any projection of either fragment, it should be kept in its place by a third slight splint to the shin. The outer splint should have a foot piece, which should be carefully padded in such a manner as to prevent the foot from turning either inwards or outwards, especially the latter. There is a very useful rule, which should be attended to in all cases of injury below the knee: it is, *to keep the great toe in a line with the inner edge of the patella.*

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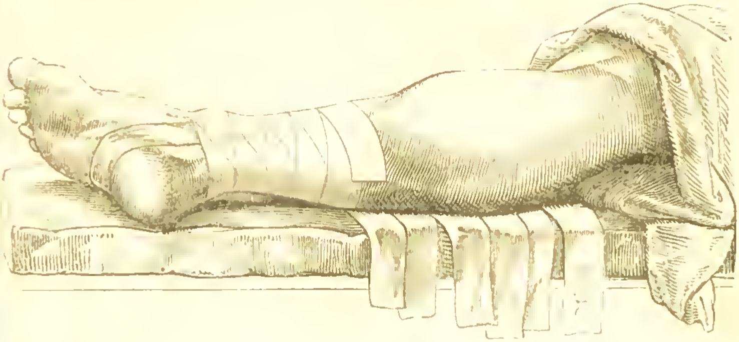
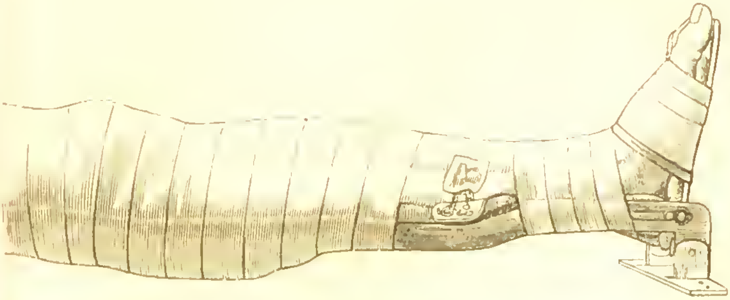
* This cut represents an old fracture of the patella, with wide separation of the fragments. The patient fractured the bone twice. The first time he was treated with bandages, &c., to bring the broken parts together, and they united well. The second time, the limb was laid in an easy position without bandages. The result is here shown:—The upper fragment high up in front of the femur; the lower one down in front of the tibia; the power of extending the joint lost. When the knee is bent, as in the above cut, the condyles of the femur are seen with the skin tightly stretched over them.



(2.) By the Macintyre's leg splint, or some of the numberless varieties of it in existence, as improved by Mr. Liston and other surgeons. The adjoining cut represents it as applied to a patient of Mr. Fergusson's in the King's College Hospital, with a compound fracture, which is left uncovered by the bandages. It is straightened out by means of the screw under the knee, as Mr. Fergusson prefers the



straight position in almost all cases of fracture of the lower extremity. Before its application, it must be made to correspond to the length of the sound limb, and must be well padded.

(3.) By the very convenient *side-splint* of Mr. Fergusson's, described in a preceding page. This may be applied either on the inner or outer side, according to circumstances.

(4.) By the *junks*. This very simple but efficient contrivance consists of a piece of old sheeting, with a bundle of reeds rolled together from either end. But it is more easy to comprehend it from seeing it once than from a page of description.*

(5.) *By the starched bandage.*—In simple cases of fracture of the leg, the patient may be permitted to leave his bed at the end of three weeks, with the fracture supported by the starched apparatus. First of all, a dry bandage should be applied from the foot half way up the thigh ; then a piece of stout pasteboard, softened in boiling water, should be accurately adapted to the limb on each side ; and the outer piece should be made to overlap the heel. In the next place, the hollows about the ankle and tendo Achillis should be well padded with tow ; and then four or five layers of roller must be put on, thoroughly imbued with mucilage of gum or starch ; and lastly a dry roller. When this has become dry (which will be in a day or two), the patient may get up, and move to his chair or sofa, but the foot must be suspended from his neck by a sling ; and he must be particularly cautioned not to attempt to move it by its own efforts.

For FRACTURE OF THE HEAD OF THE TIBIA INTO THE KNEE-JOINT the treatment is the same as for fracture of the condyles of the femur. The limb should be placed straight, so that the end of the femur may act as a splint, and keep the broken parts in their places. The whole limb should be raised, so as to relax the extensor muscles of the knee ; and this should be done in *all cases of fracture of the upper end of the tibia* (for which, consequently, the treatment by splints, with the knee bent, is inapplicable). Pasteboard splints and starched bandages should be applied, to keep the joint motionless ; but they should not cover the front of the knee so as to interfere with the leeches, fomentations, &c., that will be necessary to reduce the inflammation. *Passive motion* should be commenced in five weeks.

FRACTURE OF THE LOWER END OF THE FIBULA, about three inches above the ankle-joint, is not an uncommon accident, and may be caused by twists of the foot, or by jumping on uneven ground.

FRACTURE OF THE INTERNAL MALLEOLUS may occur in the same way ; and one or the other of these fractures commonly accompanies dislocation of the ankle.

Treatment.—They may be treated either with the bandage and two splints, or with Macintyre's splint, or with Fergusson's side-splint, or with Dupuytren's, which is a diminutive of the long straight splint, represented at p. 252. It is to be well padded, and applied to the side opposite the fracture ; but it is not so easy to keep the foot in a proper position with this, as with the other apparatus.

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* An excellent and simple machine for suspending a fractured leg has been devised by Mr. Salter, House-surgeon of King's College Hospital, and is made by Matthews of Portugal-street, Lincoln's-inn.

The surgeon will often find one or more *bags of sand* most convenient auxiliaries in keeping fractures of the leg in proper position. They may be used both to lay the broken limb upon, and also to put on either side to prevent the limb from rolling. This substance is so ponderous and devoid of elasticity that it steadily retains whatever position is given to it.

Compound fractures of the leg are to be treated on the principles already laid down for the treatment of compound fracture in general.

XIV. FRACTURES OF THE FOOT will often be attended with so much other mischief as renders amputation expedient. But an attempt should be made to save part of it; especially the ball of the great toe. Pasteboard splints and other contrivances must be used to preserve the proper position ; and if matter forms, there should be no delay in freely dividing the dense fasciæ of the foot, to let it escape.

The tuberosity of the os calcis may be broken by the action of the muscles attached to it, in the same manner as the patella and olecranon, and will unite only by ligament. The treatment must be the same as that of ruptured tendo Achillis.

CHAPTER VI.

OF THE DISEASES AND INJURIES OF THE JOINTS.

SECTION I.—OF THE DISEASES OF THE SYNOVIAL MEMBRANE.

I. ACUTE INFLAMMATION of the synovial membrane (or *synovitis*) may be produced by *local* or by *constitutional* causes. The former are blows, strains, mechanical injuries, and especially penetrating wounds. The latter are, exposure to cold, the rheumatic and gouty diatheses, and the state of constitution produced by syphilis or the abuse of mercury;—sometimes, also, this disease is a sequel of gonorrhœa. It very seldom attacks young children. The joint most frequently affected is the knee.

Symptoms.—In the most acute form, the symptoms are severe aching pain in the joint, aggravated by the slightest motion; great swelling *occurring very soon after the pain ;* redness and tenderness of the skin; and fever, which is often violent and alarming.

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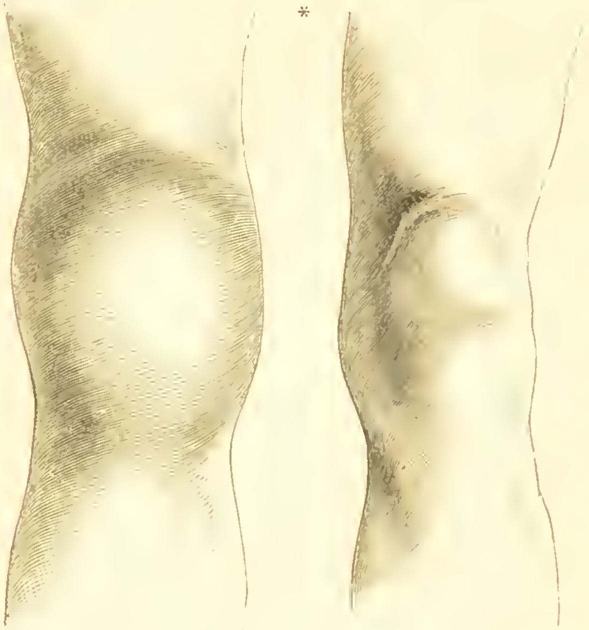

The swelling is peculiar, and is distinctive of the disease. It is occasioned by a rapid effusion of fluid into the synovial cavity; and, consequently, if the joint is superficial, it fluctuates freely. It is always most prominent at the points where the joint is least covered by ligament, and, consequently, the shape of the joint is always altered. When the knee is affected, the patella is protruded forwards, and there is a great fulness at each side of it, and at the lower and front part of the thigh. In the elbow, the swelling is most distinct above the olecranon, and in the hip and shoulder there is a general fulness of the surrounding muscles.

Prognosis.—This disease is much more serious when it affects one joint solely, and more particularly when it arises from local injury (especially a penetrating wound), than when it affects many joints, and arises from constitutional disorder. The danger to life in any case will be proportionate to the severity of the febrile symptoms, and the rapidity and sharpness of the pulse; delirium, or typhoid symptoms, show great peril.

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* Sketch of a patient affected with acute synovitis of the right knee.

Morbid Anatomy.—In slight cases the synovial membrane is reddened, and the joint contains a quantity of turbid serum. In very severe cases the membrane suppurates rapidly, and the cartilage entirely ulcerates (see paragraph III). In other severe but more protracted cases, the membrane becomes thickened, pulpy, and highly vascular; granulations form on its surface and project like fringes into the cavity of the joint and at the same time the cartilage ulcerates.

Treatment.—In all cases arising from injury, the joint, or rather the whole limb should be confined by a splint, so as to keep it perfectly motionless. This is indispensable; for the joint cannot be kept motionless without it. The best splint is very thick leather or pasteboard which admit of being easily adapted to the surface of the joint when softened in warm water, but, during the acute stage a long wooden splint, properly padded, and arranged so that it may be fastened to the limb at some distance above and below, and so that it may not touch the joint itself. If the knee is the part affected it should not be allowed to become bent on the thigh, or if it is already bent, it should be brought as nearly straight as possible. The other measures are *bleeding* from the arm, if the patient is robust, and the joint important; if not, leeches in abundance *to* the joint, or cupping *near* it; ice, evaporating lotions, or warm poppy fomentations, according to the patient's choice; a good dose of calomel, followed by saline purgatives, till the motions are no longer dark and offensive; perhaps calomel, with opium, in moderate doses every four hours, till the mouth begins to suffer; and opiates at night to relieve pain. A warm poultice of camomile flowers, boiled till they are quite soft, or bran poultice, sprinkled with laudanum; or cotton wool covered with oiled silk, will generally be found more soothing than cold applications. Blisters, it need scarcely be said, are inapplicable till the acute stage is subsiding.

When the disease is manifestly connected with rheumatism—when it is attended with red sediment in the urine and acid perspirations, and affects several joints, and extends to the synovial sheaths of tendons, colchicum should be administered, or the iodide of potassium with alkalis. F. 69, 94. But when only two or three joints are affected, or when there has been a manifest translation of the disease from some internal part, or from one joint to another, Sir B. Brodie prefers the use of calomel and opium in moderate doses, till the mouth is affected. When there is a tendency to gout, and the patient complains of grinding, excruciating pain, as if the joint were torn asunder, the colchicum is also the main remedy. In syphilitic cases (which will be known by the patient's general history, by his wan peculiar appearance, and most likely by the existence of papular or other eruptions, vide p. 191), mercury may be tried, if it has never before been given to excess; but if it has, or if the constitution is broken down, recourse may be had to the iodide of potassium in doses of gr. iii. ter die, with a small dose of colchicum and opium at night; and sarsaparilla should be given in abundance. F. 82, 83. In all these cases, warm baths, in which a quantity of carbonate of soda or potass has been dissolved, will probably be of service.

II. CHRONIC INFLAMMATION of the synovial membrane is characterized by *swelling* of the joint, of the same nature that attends the acute form, and by a dull aching *pain*, accompanied with a sense of weakness and relaxation, and not usually aggravated by pressing the articular surfaces against each other. The swelling always comes on in a few days after the pain ; and sometimes, in long continued cases of an indolent character, it is the only symptom present ; these cases are called *hydrops articuli* or *hydrarthus*. If the disease proceed, the synovial membrane and surrounding tissues may become thickened and gristly, and the swelling lose its softness and fluctuation ; and, in neglected cases, the inflammation may lead to ulceration of the cartilages and destruction of the joint. The *causes* are the same as those of the acute form, of which it may be a sequel.

Treatment.—The indications are, first, to correct constitutional disorder ; secondly, to reduce inflammation ; and thirdly, to produce absorption of the effusion and thickening, and restore the part to its proper uses.

In the first place, therefore, if the complaint is constitutional, and depends on gout, it must be treated by colchicum and warm aperients, especially the decoction of aloes and alkalis. F. 70, 94, &c. If the habit is rheumatic, colchicum, or the iodide of potassium, must be resorted to ; and in most cases, especially those following syphilis or gonorrhœa, warm-bathing, change of air, sarsaparilla, and a most carefully regulated diet, avoiding all heavy, innutritious, acescent, or indigestible substances, will be indispensable. See Part II. chap. V.

Secondly, in cases arising from local injury ; whilst there is any activity about the inflammation (especially an increase of aching pain at night), the part should be confined by a splint or starched bandage, and should be bathed with cold lotions, and blood should be repeatedly taken by leeches or cupping. Mild alteratives should also be administered, F. 63, &c.

The third indication is to be fulfilled by *counter-irritants*, beginning with blisters; which are as serviceable in the chronic as they are detrimental in the acute disease. They should be applied in succession, and be quickly healed up ; and should not be put too near the joint, if it is superficial, as the knee. The strong acetum cantharidis will often be found a very convenient substitute. After the blistering, when the activity of the disease has subsided, the iodine paint ; the tartar-emetic ointment ; the linimentum hydrargyri ; or liniments of cantharides, ammonia, and turpentine ; or of croton oil, F. 143, &c. ; the *douche*, or affusion with hot water ; and the vapour bath will complete the cure. But all stimulating applications must be at once abandoned, if they cause an aggravation of heat and pain. The ointment of Scott, F. 160, the *ceratum hydrargyri comp.* of the pharmacopœia, is one of the most useful applications for the convalescent stage of this and other chronic diseases of joints. It is applied thus; the surface of the joint, having first been washed with camphorated spirit, should be covered with the ointment thickly spread on lint; next, adhesive plaster should be evenly applied in strips, so as to form a complete casing for the joint; and lastly a bandage. When the knee is bandaged in this way, the adhesive straps should be arranged so as not to press too tightly on the patella. Supposing, *after inflammation has subsided*, the joint is left stiff,—the knee, for example, in a half-bent state—a process of very gradual extension may be set about by means of splints with a screw attached; but the greatest care must be taken not to light up a fresh inflammation.

III. ABSCESS IN JOINTS.—If, after acute or chronic inflammation, a joint becomes very much distended, and there is constant pain unmitigated by remedies, and considerable constitutional excitement, suppuration of the synovial membrane may be fairly suspected. The first thing to be done under these circumstances is to make a puncture with a grooved needle, and examine the fluid that exudes. If it is serum, two or three more punctures may be made, and an exhausted cupping-glass be applied over them; and by these means the part may be very safely and expeditiously relieved of a considerable quantity of fluid. If it is pus, a free opening should be made in a depending position, so that the matter may run out easily; the joint should be placed on a splint in the most easy and convenient posture: the general health should be amended by tonics, alteratives, and proper diet; and then, in favourable cases, a cure will be effected by *anchylosis.* But if the suppuration and constitutional disturbance increase, the limb must be amputated.

Purulent depôts in Joints.—It has been mentioned in several previous chapters, that a rapid effusion of pus into the joints and other parts is a frequent occurrence in phlebitis, puerperal fever, erysipelas, dissection wounds, and other cases in which the blood is contaminated by a morbid poison. The part becomes red and painful, and very soon afterwards is found to be filled with pus. The only local treatment consists of a free incision in a depending position, and a splint, with a bandage to prevent accumulation of matter.

IV. PULPY DEGENERATION. — Under the influence probably of chronic inflammation, the synovial membrane (generally of the knee) sometimes is converted into a thick pulpy substance of a light brown or reddish brown colour, intersected by white membranous lines. This peculiar fungous growth gradually projects into the joint and causes ulceration of the cartilages, caries of the bones, wasting of the ligaments, and abscesses in various places.

Symptoms.—Gradually increasing stiffness and swelling of the joint, *without pain;* the swelling less regular than that of chronic inflammation; and not fluctuating, although so soft and elastic that it seems so to do.

Treatment.—The progress of the disease may be retarded by rest and antiphlogistic measures; but, after a longer or shorter duration of the indolent stage, ulceration of the cartilage and hectic come on, and the patient can only be saved by amputation.*

V. CHRONIC RHEUMATIC ARTHRITIS (*Nodosity of the Joints*) most commonly affects the aged. The patient complains of racking pain in the affected joint, of a rheumatic, gnawing, wearing character, being sometimes rendered worse by changes of weather, and sometimes by the heat of the bed at night. It is not usually aggravated by pressing the articular surfaces against each other. The joint becomes stiff; its movements limited, and often attended with an audible and sensible grating sound. The muscles around it become wasted, and the limb often shortened. When the hip is the part affected, the body is bent forwards, at an acute angle with the hip ; the step is short, the power of flexing the limb on the pelvis, as in going up stairs, very limited. Sometimes, but not always, this disease is preceded by a definite attack of acute rheumatism ; sometimes it follows a bruise, sometimes occurs spontaneously in the elderly and bedridden.

The *morbid appearances* display an extraordinary expansion of the articular surfaces, irregular growths of bone around, absorption of the cartilage, whose place is supplied by porcellaneous deposit, shrinking of the cortex of the bones, and atrophy of the ligaments. In the shoulder-joint, which is frequently the seat of this disease, the glenoid cavity has been found greatly enlarged, completely divested of cartilage, and surrounded with an irregular osseous growth :—the glenoid ligament, and long tendon of the biceps absent, through which the head of the humerus may be drawn up and play against the under surface of the acromion, which may be coated with porcellaneous substance ; the head of the humerus increased in size: flattened, divested of cartilage, its cortex thin, and cancelli soft and porous, and the circumference of the anatomical neck overlaid with an irregular growth of bone ;—the capsular ligament generally thickened, but absorbed in certain places, and the tendons connected with it almost entirely atrophied and absent.

This disease may invade almost any joint, but especially the hip, the shoulder, the joints of the hand, and those of the spine. Opiate embrocations, flannel bandages, warm *douches* F. 56, and medicines calculated to obviate the rheumatic diathesis are likely to relieve, though scarcely to cure it.†

VI. LOOSE CARTILAGES sometimes commence as little pendulous growths upon the synovial membrane, which become accidentally detached. They form in any joint, but most frequently in the knee. Sometimes loose bony fragments in joints originate in the accidental fracture of one or more of the excrescences common in chronic rheumatic arthritis.

Symptoms.—They can be felt when they present themselves at the surface of the joint; and when they get between the ends of the bones, which they are very apt to do during exercise, they cause sudden excruciating pain and faintness, followed by inflammation.

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* Brodie on Diseases of the Joints, 4th edit. p. 72.

† R. W. Smith, on Fractures, &c. near Joints ; B. Bell, on Diseases of the Bones, 1828 ; Edwin Canton, on Chronic Rheumatic Arthritis, &c. Med. Gaz. 1848.

Treatment.—If possible, the cartilage should be fixed by bandages, so as to prevent it from getting between the bones; otherwise it must be removed; taking care to prepare the patient by rest, low diet, and purgatives, and to use every precaution against inflammation afterwards.

The ordinary way of operating consists, first, in pushing the cartilage to the upper part of the joint on one side of the patella, and steadying it there against the condyle of the femur; then the skin having been drawn slightly upwards, an incision is made down to the cartilage of sufficient length to let it escape. But there is a plan of operating by subcutaneous incision, which seems to have been proposed almost simultaneously by Mr. Syme of Edinburgh, and M. Goyraud, and which avoids the danger of a direct wound into the joint. According to this plan, the cartilage having been pushed up as high as possible into one of the synovial pouches by the side of the patella, a long narrow knife is passed down upon it through the skin two or three inches above, and made to divide the synovial membrane to such an extent, that the cartilage may be squeezed through it into the subcutaneous cellular tissue, but without enlarging the wound in the skin. There the cartilage must remain till the wound in the synovial membrane has had time to heal; and then it may, if desired, be easily removed by an incision through the skin; but if it causes no inconvenience it may be allowed to remain.†

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VII. Pendulous Fleshy or Gristly Tumours may produce many of the symptoms of loose cartilages. They may, perhaps, be distinguished by being less hard, and by being stationary. They have been extirpated from the knee, but of course with very great hazard to life.

SECTION II.—INFLAMMATION OF THE CELLULAR TISSUE.

Inflammation of the cellular tissue around a joint is a peculiar affection, particularly described by Mr. Wickham. It commences with a tolerably firm swelling, various in extent; attended with slight obtuse pain, and caused by a deposition of lymph, which renders the tissue hard and brawny. As it increases, the skin becomes distended, white, and shining, and the pain and constitutional distress extreme. After this *adhesive stage* has lasted an uncertain number of months, suppuration occurs at one or more points; and the abscesses burst through the synovial membrane, and cause irreparable disorganization of the joint.

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* This cut exhibits a parasitic cartilage, shaped like a melon seed—in its original situation. From the Museum of the Middlesex Hospital.

† Vide B. & F. Med. Review, vol. xi. p. 526, and Fergusson's Practical Surgery, p. 321.

Treatment.—Leeches or cupping, and cold lotions, followed after a time by Scott's ointment (F. 160, 6). Mr. Wickham deems counter-irritants and friction injurious.*

SECTION III.—THE LIGAMENTS.

I. INFLAMMATION.—Authors have described a form of inflammation of the ligaments of joints characterized by great pain from motions that shake, or twist them.† It must be treated like the subacute fascial inflammation.

II. RELAXATION.—If any joint have been long disused, and especially if its innervation is impaired, its ligaments are liable to become relaxed and elongated, so as even to permit the dislocation of the bones to which they are attached. Thus in a case related by Mr. Stanley, which followed an attack of hemiplegia, the ligamentum teres and capsular ligament of the hip were so elongated as to permit the head of the femur to slip out of the acetabulum. A similar result may ensue from long-continued chronic synovitis or rheumatism. Mechanical support, blisters, friction, cold affusion or sea-bathing, and electricity, are the only available remedies.‡ Slighter degrees of relaxation occurring to weakly children, may be cured by good diet, tonics, and friction.

SECTION IV.—THE CARTILAGE.

The affection of cartilage in which the surgeon is interested, is its ulceration; a process which Dr. Redfern has shown to be under all circumstances the same. The cartilage cells became enlarged, crowded with corpuscles, and at last burst and discharge their contents on the surface; whilst the hyaline or intercellular substance splits into bands and fibres, and together with the discharged corpuscles, forms in some cases a fibro-nucleated membrane on the surface of the cartilage. Together with these changes, more or less fatty degeneration may be combined.

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* Wickham on the Joints, p. 84, Winchester, 1833. See also Nicolai, quoted in Coulson on the Hip Joint, p. 85. Mr. South gives two cases of this rare disease in his Trans. of Chelius, vol. i. p. 210. What used to be called *white swelling* of the knee joint seems really to have consisted of a similar degeneration of the cellular tissue around the joint.

† Mayo's Pathology, p. 79.

‡ Vide six cases of dislocation from this source, narrated by Mr. Stanley in Med. Chir. Trans. vol. xxiv.

These changes in the cartilage may either be or be not attended with a tendency to disorganization of the other textures of the joint. If there be no such tendency in the other textures (as in the senile ulceration), the mere changes in the cartilage may give rise to no symptoms whatever. If there be such a tendency (as in the ulceration which accompanies mismanaged synovitis, and that destructive disease commonly known as white swelling), it is doubtful whether the symptoms do not in reality arise from the accompanying disease of the bone, or of the synovial membrane.

I. SENILE ULCERATION.—The cartilage of the joints of elderly persons is sometimes ulcerated so as even to denude the bone. This state may exist without producing any symptoms, except, perhaps, a slight grating. Sometimes before its disappearance the cartilage is converted into a soft fibrous or villous structure; and its place is afterwards supplied by a crust of that extremely hard and dense bone, which is commonly known under the name of porcellaneous, or ivory deposit.*

II. ULCERATION of cartilage is the climax of all severe affections of the structures entering into the composition of joints. It is a very common consequence of inflammation of the synovial membrane, acute or chronic, and is a constant consequence of caries of the joint-ends of the bones. It seems highly probable that it may be effected, as Mr. Key pointed out,† by the instrumentality of those highly vascular fungous granulations which project like fringes from the synovial membrane over the cartilage after severe acute or chronic inflammation.

It seems equally probable that absorption of the cartilage—beginning on that surface which is attached to the bone—may be caused by the red fungous granulations which arise in the cancelli of the joint-ends of the bones when carious.

We have before spoken of that rapid ulceration of cartilage which is a consequence of unchecked synovitis; but now we have to treat of that very common disease *chronic ulceration.*

III. CHRONIC ULCERATION of cartilage commonly affects persons of bad, scrofulous constitutions, between the age of puberty and thirty-five; and is usually ascribed to cold, or to neglected injury.

Symptoms.—For the first few weeks (or perhaps months) of this disease, the patient complains only of slight occasional rheumatic pains, perhaps flying about and affecting several joints, but at length settling decidedly in one. After a time, the pain increases in severity, especially at night, and it is generally *referred to one small spot, deep in*

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* This change is said to occur in the astragali of old draught horses, without occasioning any inconvenience to the animals. Richet, quoted in Brit. and For. Med. Rev., Jan. 1846. According to Mr. Quekett, the porcellaneous substance consists of an extremely dense bone, with its Haversian canals filled up by bone-earth. Quoted in Canton, op. cit.

† Key, Med. Chir. Trans. vol. xviii. and xix; Goodsir, Anat. and Path. Obs. Edinburgh, 1845, and Rainey on fatty degeneration of cartilage, quoted in South's Chelius, vol. i. p. 274; Redfern on Anormal Nutrition in Human Articular Cartilages, Edinburgh, 1850.

the joint, and is compared by the patient to the gnawing of an animal. Moreover, it is usually accompanied by *an aching of some other part of the limb;* thus, when the hip or elbow is affected, there is an aching of the knee or wrist; but it is important to notice, that both the pain in the affected joint, and the sympathetic remote pain, are always aggravated by motion of the joint, and by pressure of the articular surfaces against each other. As the disease proceeds, the suffering becomes most excruciating, and is attended with painful *spasms and starting of the limb during* sleep; so that the patient's rest is broken, his spirits exhausted, and his appetite and general health rapidly impaired. At first the pain is unaccompanied with any swelling; in fact, this symptom never appears in less than four or five weeks, and often not for as many months; and when it does appear, it is slight; and as it depends on an infiltration of the tissues *around* the joint, and not on effusion *into* it, the shape of the joint is unaltered.

Terminations.—In fortunate cases, that are subjected to judicious treatment at an early stage, the ulceration may be arrested, and the diseased surfaces will throw out lymph and heal; or very probably the lymph effused by two opposite ulcerated surfaces will unite, and *anchylosis* will be produced. But, in unfavourable cases, the ulceration proceeds and lays bare the bone, which becomes carious, and can be heard to grate on the least motion; suppuration occurs into the joint, and numerous tortuous abscesses form around it, so that the surrounding soft parts are disorganized; the ligaments are destroyed, so that the flexor muscles, which have long kept the joint immoveably bent, at last dislocate it; if the knee is affected, for instance, the head of the tibia is drawn backwards into the ham; and at last the patient, unless amputation is performed, dies exhausted with hectic.

The *prognosis*, in the first stage, that is, before swelling has occurred, may be favourable; but after swelling has existed for some time, the patient will be fortunate in recovering with anchylosis; and after suppuration, he will (especially if an adult) be almost certainly compelled to suffer amputation.

Treatment.—The first and the most indispensable measure is *perfect rest;* which must be insured by confining the joint with a starched bandage (not too tight) or leather splint. The splint or bandage should have apertures in it to allow the application of counter-irritants. 2. Occasional *leechings*, or small cuppings, in the early stages, when the pain is severe. But loss of blood is merely a palliative of accidental fits of inflammation, and must not be carried too far. 3. *Counter-irritation* either by a seton, or caustic issue, or the actual cautery. If the knee is affected, an issue may be established on each side of the head of the tibia. Sir B. Brodie recommends, in these cases, that the issue should be kept open by rubbing the sore occasionally with caustic potass, or the sulphate of copper, rather than by peas. The actual cautery is exceedingly efficacious, and not half so painful in reality as might be imagined, and the patient may be rendered unconscious of it by chloroform.* For children, blisters answer very well; and it is better to keep one blister open than to apply a succession of them. Sir B. Brodie has shown, that issues, when long established, sometimes irritate the constitution, bringing on a return of the pain which they relieved at first, and which will again depart if they are healed up. It is a practical rule, therefore, to give them up for a time, before condemning a joint to amputation. The ointment of Scott, applied as described in a preceding page, will often be found a useful auxiliary to time and quietude. 4. *Mercury* should be given so as to affect the system; Sir B. Brodie believes that the administration of mercury in ulceration of cartilage is one of the greatest improvements in modern surgery.† 5. If the patient is unable to take mercury to the above extent, sarsaparilla and the iodide of potassium, F. 82, with small alterative doses of mercury, F. 63, may be tried: and in all cases the general health must be maintained by tonics, change of air, &c., and pain be allayed by opiates. 6. When abscess forms, there need be no haste in opening it; but if the skin becomes very much distended, it may be punctured, and the part be wrapped in a fomentation cloth, so that the matter may gently exude. No rough squeezing is admissible. If the puncture heals, another may be made when necessary—if it remains open, it should be made large enough to let the matter flow out freely as soon as it is secreted. The case must then be treated according to the directions for abscess in joints.

SECTION V.—ARTICULAR CARIES.

CARIES OF THE HEAD OF A BONE is not an uncommon cause of ulceration of the adjacent cartilage and disorganization of the joint. The affected bone is found to be soft, red, and vascular, and deficient in earthy matter, so that it is easily cut or crushed; its cancelli are filled with a reddish fluid, and in scrofulous cases a cheesy matter is deposited in them. Owing to this softened state of the bone, the cartilage peels off from it readily. When peeled off, its under surface is probably found ulcerated; and between it and the bone there is a small quantity of highly vascular

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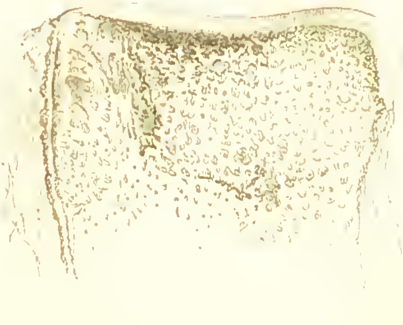

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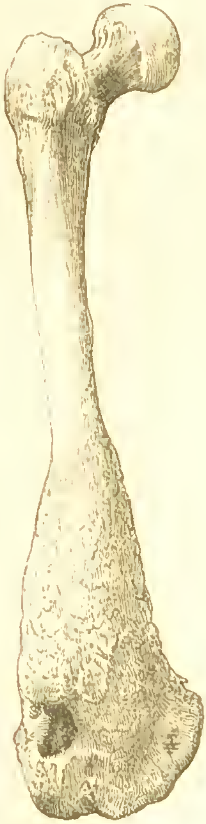
* Refer to the Index. † Lectures, Med. Gaz. vol. xxxvii.

‡ This cut exhibits caries of the astragalus, with incipient separation of the cartilage. From the King's College Museum. The next shows a state approaching to *spina ventosa*.

lymph growing out of the carious cancelli. When the cartilage is perforated, inflammation and suppuration ensue in the joint, and the case then pursues the same course as the ulceration of cartilage, although a slower one. In some few cases, from the rapidity of the caries, the cartilage is detached *en masse;* and sometimes necrosis of a small portion of the bone ensues.



This disease most frequently affects the knee, elbow, and small bones of the carpus and tarsus; it is very common in scrofulous children, but rare after thirty. An advanced stage gives rise to what was formerly called *spina ventosa;* that is, the extremity of the bone becomes greatly enlarged by superficial deposits, but is hollowed out into a mere shell by caries in its interior.

The *symptoms* are nearly the same as those of ulceration of cartilage; that is, fixed pain, extending to different parts of the limb, aggravated by motion, and unaccompanied at first by swelling. But in scrofulous cases there is a remarkable absence of pain, except during the formation and bursting of abscesses.

Treatment.—This is also nearly the same that is required for ulceration of cartilage. The chief dependence is to be placed on *perfect rest*, by means of the leather splint; on pure air, good diet, steel, sarsaparilla, and other anti-scrofulous remedies, by the use of which a better state of nutrition may be induced, and the constitution be enabled to repair the local disease; and on the various measures that have been directed for the constitutional treatment of scrofula. *Issues* are not advisable in genuine scrofulous cases, as a general rule; but they are of great service when the pain is severe and continuous. Small *leechings* may be also occasionally expedient to relieve accidental fits of inflammation. Free issue should be given to pus when it forms. *Amputation* need not be so hastily performed in general in this disease as in the last; both because the patient has a greater chance of recovery with anchylosis, and because it seems probable that disease of the lungs or mesentery is sometimes suspended or averted by the continuance of a (not very severe) disease in the extremity. If, however, the pain is so serious that it exhausts the strength and spirits, the part must be amputated; because the continuance of so severe an outward disease might induce the very same disease in the lungs or mesentery, which a more moderate degree might avert. Recovery without amputation is far more probable when one of the larger articulations is affected, than when the complicated joints of the tarsus or carpus are involved. *Excision* of the extremities of the diseased bones should be resorted to, when practicable, instead of amputation.

GENERAL DIAGNOSIS.—It may be useful to present a concise view of the differences of the three principal chronic diseases of joints, as regards their two principal symptoms—viz. pain and swelling. The *pain* in chronic synovitis is not very severe; it usually increases for ten or fourteen days, and then declines; and it is not *immediately* aggravated by motion, or by pressure of the articular surfaces against each other. In *ulceration of the cartilage*, the pain is very severe, continuous and exhausting, and increases as the disease advances, becoming greater after the occurrence of swelling; moreover, it is attended with sympathetic pain of some other part of the limb, and is always aggravated by motion. "In *articular caries* in scrofulous children," says Brodie, "there is not that severe pain which exhausts the powers and spirits of the patient," as in ulceration of the cartilage; but it must be confessed, that in cases occurring to adults, there is very little difference in this respect.

The *swelling* in *chronic synovitis* comes on in the course of a few days; it fluctuates freely, and alters the form of the joint. In the other two affections it does not come on till after some weeks or months, and it does not alter the shape of the joint; but as it depends on a general infiltration of the tissues around the articular extremities, it seems as if it were caused by enlargement of the bones; the skin moreover is free from redness; hence the term *white swelling*, by which these two affections are commonly designated.*

SECTION VI.—ANCHYLOSIS.

ANCHYLOSIS, or immobility, is a frequent consequence of serious injuries and diseases of joints; therefore, whenever it is likely to happen, the affected joint should be placed in the position which will be the least inconvenient for it to preserve. The elbow should be placed at a right angle; the wrist straight; the hip and knee a very little bent; and the ankle at a right angle to the leg. There are three varieties of anchylosis.

1. The *spurious* or *false* anchylosis, which depends on thickening and deposits into the synovial membrane and ligaments, and rigidity of the muscles. The extensor muscles are apt, in almost all cases where a joint is diseased, to become paralysed and wasted; and the flexor muscles to fall into the state of *rigid atrophy*, becoming short,

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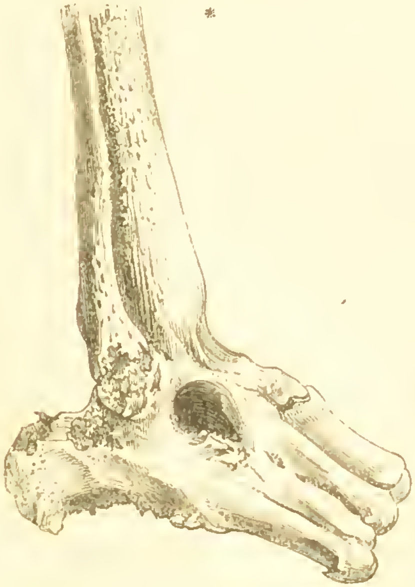
* "Ulceration may be suspected," says Mr. Mayo, "when with little or no fluid in the synovial membrane, there is pain of the joint, accompanied with acute sensibility to pressure or motion of the articular cartilages on each other."

inextensible, and very probably dislocating the joint, by their continued traction. This form of anchylosis is very common after synovitis.

Treatment.—Daily vigorous friction with stimulating liniments over the extensor muscles; vapour baths, or the local steam bath—shampooing—and passive motion—that is to say, the joint to be every day bent and extended with a gentle degree of force, not sufficient to cause much pain. If one or more rigid muscles seem to be the main obstacles, their tendons may be divided, by subcutaneous section.

2. *Ligamentous* anchylosis signifies the union of two articular surfaces by ligament, and is an occasional consequence of compound dislocation, and of ulceration of cartilage. It admits of only very gentle treatment by passive motion, especially if it follow disease, and by gentle endeavours to straighten the joint, if necessary, with a screw.

3. *Bony anchylosis* is produced when the lymph that is effused after destruction of cartilage ossifies. It is incurable, except by sawing through the bone, or cutting out a wedge-shaped portion, and then employing frequent motion so as to prevent the consolidation of a callus and to establish a false joint. This operation was successfully performed by Dr. Rhea Barton, of Philadelphia, on the hip, in 1827, and on the knee in 1838. It was also successfully performed by Dr. Gibson, of Philadelphia, in a case of complete anchylosis of the knee, with not a vestige of ligament, cartilage, or synovial membrane remaining. Having laid bare the front of the joint by a V incision above the patella, he sawed out a wedge-shaped portion of the bone, and gently bent the rest so as not to endanger the popliteal vessels.† But of course this is so serious an operation, that it must not be undertaken inconsiderately.



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* This cut shows the results of long-continued disease of the ankle joint. The bones are completely *welded* together by bony anchylosis.

† Vide American Jour. Med. Sc., July, 1842, and a case by Dr. Buck, Ranking's Abstract, vol. iii. For further information consult Liston and Fergusson.

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SECTION VII.—OF DISEASE OF THE HIP-JOINT, OR MORBUS COXÆ.

This joint is exceedingly liable to chronic disease, and there are certain peculiarities in the symptoms which render it expedient to devote a section to it in particular. It is uncertain whether scrofulous caries of the head of the femur, or whether ulceration of the synovial membrane and cartilage is the primary morbid change; but the symptoms and ulterior consequences are nearly the same.

Symptoms.—The disease begins with slight occasional pain, and more or less stiffness and weariness in the joint and lameness in the gait. As it advances, the pain becomes very excruciating in the cases of ulceration of cartilage, whilst in those of scrofulous caries it is comparatively trifling; but in both forms it is felt chiefly in the knee; and in the scrofulous caries, this pain in the knee may be the only symptom complained of; nay, there may even be some swelling there. The criterion, however, is, that if the surgeon presses on the hip-joint, either in front over the psoas and iliacus, or behind the great trochanter, or if he jerks the femur upwards against the acetabulum, pain will be felt in the hip, and the pain in the knee will be greatly aggravated.

After these symptoms have gone on increasing for a variable time, the nates become wasted and flabby, and the whole limb weaker, and it is noticed that the affected limb is, or appears to be, longer than the sound one; a lengthening which possibly may depend in some slight degree on effusion into the synovial membrane, and protrusion of the trochanter, but much more probably is caused by the patient's habit of standing with his weight supported entirely on the sound limb, and of lowering the diseased side of the pelvis, and stretching out the diseased leg to steady himself with. Sometimes, instead of being lengthened, the limb is apparently shortened, as shown in the adjoining cut, No. 1, which gives a bird's eye view of a child, a patient of Mr. Partridge's, in the King's College Hospital. This apparent shortening is caused by muscular action, and by the patient's endeavours to throw the limb into an easy posture; it varies from time to time, and is not to be seen in all cases.

But if the disease proceed, there comes another kind of shortening, caused either by the destruction of the neck of the femur by caries, or by the destruction of the acetabulum and capsular ligament, and dislocation of the bone upwards by the muscles. The deformed appearance caused by this dislocation is well exhibited in the following sketch (fig. 2), taken from a patient under the care of Mr. Fergusson, in the King's College Hospital; it also shows the apparently broad and large, but really wasted and flattened, form of the nates. The effect of the altered length of the limb in distorting the spine is also seen. Sometimes the limb is turned inwards, as in dislocation on the dorsum ilii; or outwards, as in fracture of the neck of the femur; this is accidental. This organic shortening is usually attended with an increase of the pain and of the starting of the limb during sleep, and is in most cases (but not all) soon followed by abscess, which may burst on the nates or the groin, or may burrow between the muscles of the thigh ; or the acetabulum may be perforated, so that the matter passes into the pelvis and bursts into the rectum. From this suppuration stage it is exceedingly rare for an adult to recover, although, in the case of children, the prognosis is not unfavourable, if the strength is pretty good, and the lungs free from disease; and the patient may be so fortunate as to recover with an anchylosed hip. The duration of the disease may vary from two or three months, to several years.

Fig. 1.

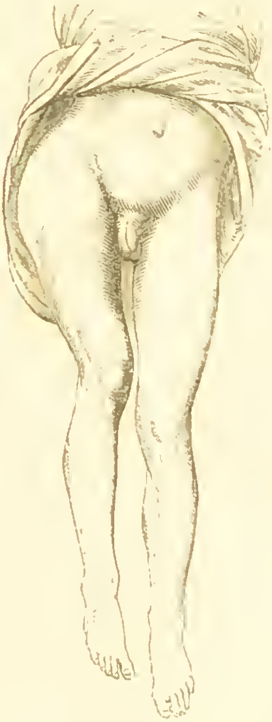
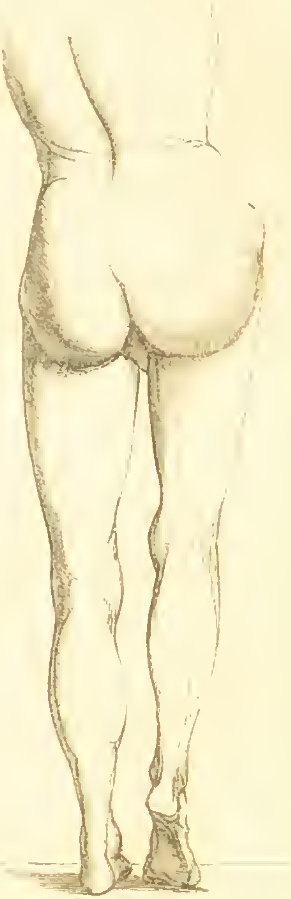


Fig. 2.



Diagnosis.—From *psoas abscess* it may be distinguished by the absence of pain in the back. From *chronic rheumatic arthritis*, by the history of the case, the age of the patient, the absence of audible crepitation, and by the pain caused by pressing the articular surfaces against each other; which is not a character of the chronic rheumatic affection.

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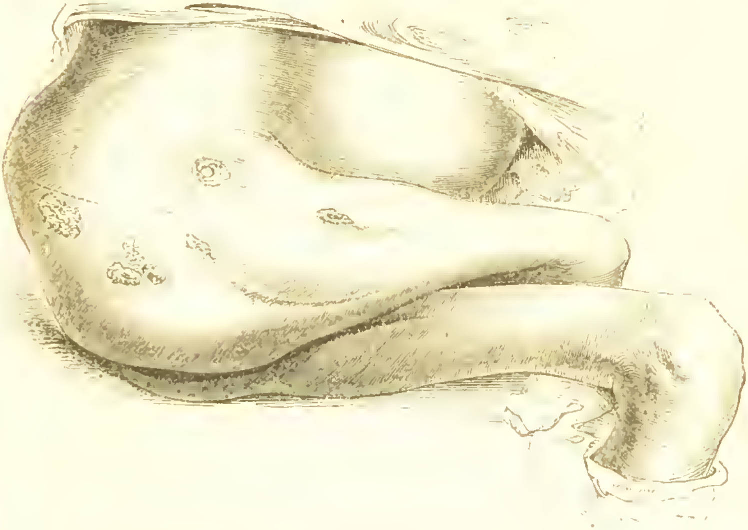

Yet it must be remembered that this latter disease may lead to abscess if the patient meets with injury. The great pain caused by pressing the femur against the acetabulum will distinguish this disease from *sciatica.*

Treatment.—This must of course be the same in principle as the treatment of other diseased joints. If the patient comes under treatment in the earliest stage, the limb should be maintained at *perfect rest in the straight posture*, by means of a straight splint reaching from the axilla to the foot. If distortion has already commenced, a bandage of leather or pasteboard should be applied; and the patient should not be permitted to lie constantly on the sound side, else the distortion of the spine and the chance of dislocation will be enhanced. Cupping or leeching, if there is considerable pain and tenderness, with strength sufficient, will be of great service in the early stages, and a course of mercury may be cautiously tried. But the principal dependence is to be placed on cod liver oil and tonics, and on counter-irritation by means of an issue behind the great trochanter, or at the anterior edge of the tensor vaginæ femoris, or by a seton in the groin; and these measures should not be neglected, even though suppuration has commenced. When abscess forms, it should be opened in the manner described in the section on chronic abscess, although it must be added that this is a plan of treatment which Sir B. Brodie does not believe to possess any particular advantage.

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* Sketch of the patient from whom Mr. H. Smith removed the head of the thigh bone. It illustrates the extraordinary attitudes which patients are liable to acquire. The dotted lines show the course of Mr. Smith's incisions.

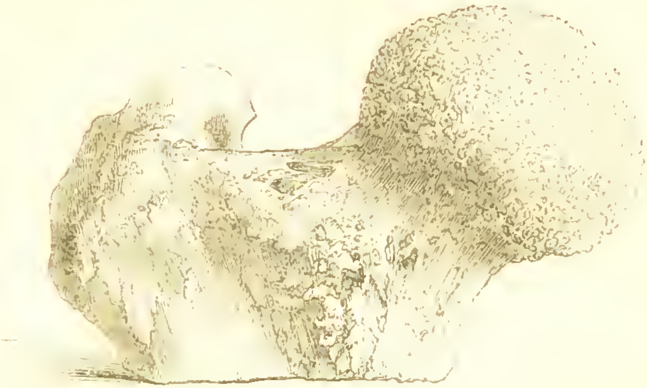
The *position* of the patient in bed is a point of considerable importance, as if left to himself he is apt to acquire the most distorted and ungainly attitude. "The following contrivance," says Mr. Coulson, "will be found very useful:—a double inclined plane should be formed by joining two portions of wood together in such a manner that when the child's hams are made to correspond with the angle of junction, his legs and feet should extend down one plane, and there be confined to the foot-boards by rollers, whilst his thighs and buttocks extend down the other. The foot-boards will also have the beneficial effect of removing the weight of the bed-clothes from the feet. Opposite the anus a small opening should be made to admit the passage of the fæces. The whole trunk of the child should lie quite horizontally on the bed."

The *prone position* is recommended by Coulson in the latter stages; as it avoids pressure on diseased and ulcerated hips; it allows dressings to be readily applied, and counteracts the patient's habit of lying with the diseased limb drawn up across its fellow. A couch is constructed with an angle, corresponding to the bend of the hips; it has one part horizontal on which the abdomen and chest repose, while the pelvis and legs hang down an inclined plane.

In cases in which a carious head of the femur has been lying out of its socket for some time, keeping up constant irritation and discharge, with no chance of benefit from ordinary local or constitutional remedies, whilst the acetabulum and bones of the pelvis, as well as the lungs, kidneys, and other viscera, are free from active disease, *excision of the head of the femur* may be proposed.

This operation was first performed by Mr. Anthony White, in 1821, with perfect success, although Sir E. Home, and the medical officers of St. George's Hospital gave it as their opinion that it would be useless, impracticable, and fatal. It was revived by Professor Fergusson in 1845, and has since that time been performed twice by that gentleman, once by Mr. Simon, Mr. H. Smith, Mr. French, Mr. Haynes Walton, Mr. Cotton of Lynn, and Mr. Morris of Spalding, and with such an amount of success that it may now fairly rank amongst the established operations of surgery; and it is a strong argument in its favour that the acetabulum, although originally involved in the disease, yet frequently sets up a process of repair, and becomes filled with fibrous membrane, so soon as it is relieved by dislocation from the presence of the carious head of the thigh-bone. It is not a difficult proceeding. An incision five or six inches in length is made over the diseased and displaced bone; another at right angles across the trochanter; the soft tissues are cleared away from the bone (they consist of little more than skin and cellular tissue, for the thick muscles which cover the part in health are long since wasted), the saw is applied below the trochanter, and the head of the bone with that process removed.

The adjoining cut shows the portion of bone removed by Mr. H. Smith. After the operation the limb must be brought into the straight position, and be kept at rest by means of a long splint, and the case be treated on general principles. If everything goes on well, the patient will recover a useful limb with a considerable degree of motion at the hip, and can walk comfortably with a high-heeled shoe.*



SECTION VIII.—WOUNDS OF JOINTS.

Symptoms.—A wound may often, but not invariably, be known to have penetrated a joint, by the escape of synovia, in the form of small oily globules.

Treatment.—The object is to avert acute inflammation of the synovial membrane, which might prove fatal. If, therefore, the part wounded be the knee, and if the skin be so torn or injured that the wound cannot be closed, or so that it is certain not to unite by adhesion, and if the patient's constitution be bad, amputation should be performed at once. Otherwise, the wound should be carefully closed with a piece of lint dipped in blood ; the joint should be kept quite motionless on a splint ; and every local and constitutional measure be adopted, to avert or subdue inflammation. See Sect. I.

* Vide Brodie, op. cit. ; Wickham, op. cit. ; Coulson, op. cit. ; W. C. Hugman on Morbus Coxarius, Lond. 1849 (*recommends the prone position, and extension*) ; O'Beirne and Bellingham, on the use of Mercury in early stages, quoted in Ranking's Abstract, vol. x. p. 290, from Dub. Med. Press ; Fergusson's Surgery, 2nd. edit. p. 380 ; and Clin. Lect. Lancet, 1849, vol. i. p. 359 : Anthony White's case in Cooper's Surg. Dict. *Art.* Bones, Excision of ; Henry Smith, Essay in Lancet, 1848, vol. i. p. 361, and various Letters in Lancet, 1849 ; Professor Syme, Lancet, 1849, vol. i. p. 266 (*objects to the operation*) : Mr. Cotton's case, Med. Gaz. 1849 : and a case by Mr. Skey, Med. Gaz. Aug. 31, 1850.

SECTION IX.—OF DISLOCATION OR LUXATION GENERALLY.

Symptoms.—The symptoms of dislocation are two: — 1. *Deformity;* there being an alteration in the form of the joint; an unnatural prominence at one part and a depression at another, together with lengthening or shortening of the limb. 2. Loss of the proper motions of the joint.

Causes.—Dislocation may be caused by external violence, or by muscular action. And the circumstances that enable muscular action to produce it are,—a peculiar position (as when the jaw is very much depressed); paralysis of an antagonist set of muscles; elongation of ligaments; or fracture or ulceration of some process of bone. Thus ulceration of the acetabulum permits the head of the femur to be dislocated upwards, and fracture of the coronoid process permits the ulna to be dislocated backwards.

Morbid Anatomy.—Dislocation is almost of necessity attended with some rupture of ligaments, which, however, readily unite and heal. If the dislocation be left unreduced, the lymph thrown out around the head of the bone in its new situation becomes converted into new ligaments, and into a new socket, which is lined with a smooth ivory substance, and not with cartilage; and a very useful degree of motion is often acquired. Meanwhile the old socket gradually becomes filled up.

Diagnosis.—Dislocation may be distinguished from fracture, 1. by the *absence of crepitus*. For although a slight *crackling* is often perceptible, owing to an effusion of serum into the cellular tissue, it can hardly be mistaken for the *grating* of fracture. 2. By the circumstance, that the surgeon can move a fractured bone more freely than is natural, and a dislocated one less so. 3. By *measurement* of the bone supposed to be broken, which, if broken, will be most probably shortened. 4. If a fractured bone be drawn into its proper shape, the distortion will return so soon as the extension is discontinued: if a dislocated bone be drawn into its proper place, it will remain there.

Treatment.—The reduction of dislocations may be effected by fixing the part from which the bone has been dislodged, and extending the dislocated bone in such a manner that the muscles may draw it into its socket.* The extension should be made in such a position as to relax as many of the opposing muscles as possible. After reduction, leeches, fomentations, and purging, must be used if required, to prevent inflammation, and the joint should be kept at rest till any laceration of its ligaments may have healed, otherwise the dislocation may be perpetually recurring.

Dislocations should always be reduced as quickly as possible, before the patient has recovered from the shock of the injury, and before the muscles have had time to contract and fix the bone in its new situation. The patient should be engaged in conversation during the process, in order to take off his attention from the muscles whose force it is wished to counteract. If there is great muscular rigidity, it may be overcome by chloroform, which is much to be preferred to the bleeding, the half-grain doses of tartar emetic, and the hot bath, that were formerly prescribed.

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* Mr. Vincent advises, especially in dislocations of long standing, that the extension be made not from a fixed point, but from various points in a circle of some magnitude.

COMPOUND DISLOCATION is a dangerous accident, because of the acute synovial inflammation, rapid ulceration of cartilage, and violent constitutional disturbance, with which it is liable to be followed. The necessity of amputation will depend on precisely the same contingencies as in compound fracture: — old age; bad constitution; shattering of the bone; extensive bruising or laceration of the integuments, so that the wound cannot be closed; laceration of large blood-vessels: or if it be the knee-joint, if the limb is to be saved, the dislocation must be reduced; if the end of the bone protrude through the skin, and render reduction difficult, it must be sawed off, or the aperture must be slightly dilated; the wound must then be closed, and covered with a piece of lint dipped in blood; and the case be treated as a wounded joint.

DISLOCATION AND FRACTURE.—Supposing the femur or humerus to be dislocated, and fractured also, Sir A. Cooper directs the fractured part to be first well secured in splints and bandages, and then the dislocation to be reduced without delay. Because, if the dislocation is not attended to till after the fracture has united, the difficulty of reducing it will be very much increased through the lapse of time; and, perhaps, the bone may be broken again during the forcible extension that will be necessary.

CONGENITAL DISLOCATION is the result of original want of development, or of intra-uterine disease, and is mostly incurable.

SECTION X.—OF PARTICULAR DISLOCATIONS.

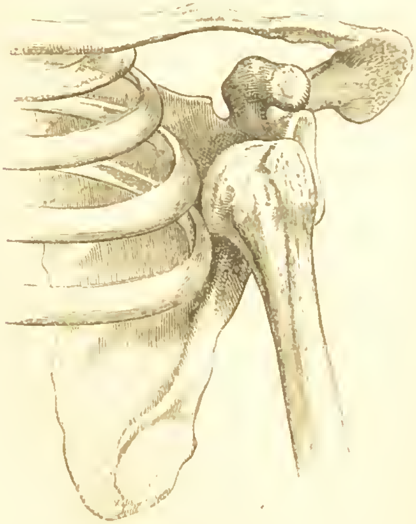
I. DISLOCATION OF THE JAW may be caused by a blow on the chin, when the mouth is wide open, or by spasm of the pterygoid muscles, by which the articular condyles are drawn over the transverse root of the zygomatic process.

Symptoms.—The mouth fixedly open, the patient unable to shut it; speech and deglutition almost impossible; saliva dribbling away; the chin protruding forwards; and the condyle felt to project unnaturally under the zygomatic process, whilst the finger sinks into the parotid space. If one side only is dislocated, the chin will be turned towards the opposite.

Treatment.—The surgeon should first fix the head carefully against a wall, or high chair; next wrap a napkin around his thumbs, and place them at the roots of the coronoid processes behind the molar teeth; then he should press them downwards and backwards, elevating the chin at the same time with his fingers. Or he may place the handle of a fork on the last molar teeth, and depress them with it using the upper teeth as a fulcrum. Or a piece of cork may be put between the molar teeth in order to act as a fulcrum, whilst the chin is elevated. After reduction, the chin must be confined for a week or two by a *four-tailed bandage*.

II. DISLOCATIONS OF THE CLAVICLE.—The *sternal extremity* of this bone may be dislocated *forwards* by blows on the shoulder. It can readily be felt on the anterior surface of the sternum. The *treatment* is in all respects the same as for fractured clavicle. Dislocation of this end of the bone *backwards* has been caused by curvature of the spine. It produced so much pressure on the œsophagus as to threaten starvation, and was in consequence extirpated by Mr. Davie of Bungay. There are also a few cases on record of dislocation of this end of the clavicle backwards by violence. Pain and difficulty of breathing are the consequences; the reduction and subsequent treatment the same as for the dislocation forwards.*

The *outer extremity* of the clavicle may be dislocated *upwards* on the acromion. The shoulder is sunken and flattened, and on tracing the spine of the scapula, the end of the clavicle can be felt upon the acromion. The outer extremity of the clavicle has also been known to be dislocated *under* the acromion by a kick from a horse on the shoulder.† The treatment is the same as for fracture of the clavicle.



III. DISLOCATION OF THE SHOULDER-JOINT may occur in three principal directions. The head of the humerus may be thrown downwards, forwards, and backwards; besides which it may be partially dislocated forwards and upwards.

1. In the dislocation *downwards* or *into the axilla*, which is the most common, the head of the bone rests on the axillary plexus of nerves, between the subscapularis muscles and the ribs.

Symptoms.—The arm is lengthened; a hollow may be felt under the acromion, where the head of the bone ought to be; the shoulder seems flattened; the elbow sticks out from the side; and the head of the bone can be felt in the axilla, if the limb be raised; although such an attempt causes great pain and numbness.

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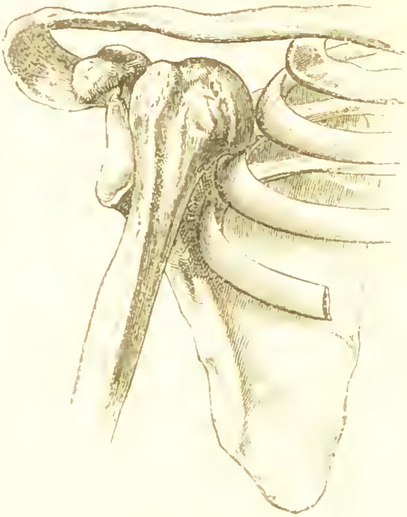
* Vide a case by M. Pellieux in the Revue Médicale. Aug. 1834, p. 151, and another by Mr. Brown of Callington, Med. Gaz., Aug. 1, 1845.

† Forbes's Rev. vol. vi.

Diagnosis.—There are three fractures liable to be mistaken for this dislocation: viz. fracture of the *acromion;* of the *neck of the scapula;* and of the *neck of the humerus.* The first two may be known by the facility with which the form of the joint is restored by raising the limb, and by the crepitus felt on doing so. In fracture of the *cervix humeri,* the limb is *shortened,* instead of being lengthened as it is in dislocation; there is not so much vacuity under the acromion; and the rough angular end of the shaft may be felt in the axilla, instead of the natural smooth head of the bone.

2. In the dislocation *forwards,* the head of the humerus is thrown on the inner side of the coracoid process, and may be felt under the clavicle.



Symptoms.—The arm is shortened; the elbow projects backwards; the acromion seems pointed, and the head of the bone cannot be felt under it.

3. In the dislocation *backwards,* the head of the bone may be felt on the dorsum scapulæ; and the elbow projects forwards.

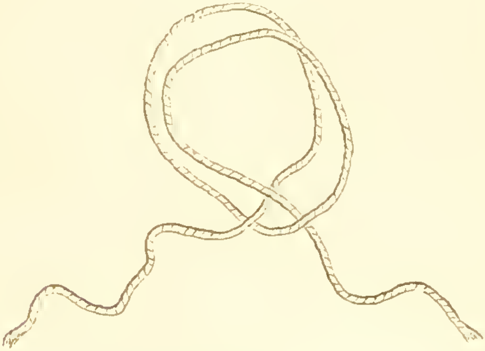
4. In the *partial dislocation forwards,* the head of the bone is thrown partly off from the glenoid cavity against the coracoid process. The symptoms are, projection of the acromion and a hollow under it at the back of the joint, whilst the head of the bone is prominent in front, and may be felt to move on rotating the elbow; cramps of the hand; and difficulty of raising the elbow, because the head of the bone strikes against the coracoid process.

5. The *partial dislocation upwards* is attended with a displacement of the biceps tendon from its groove, as we shall mention more particularly presently.

Treatment.—There are five methods of reducing the first or downward form of dislocation.

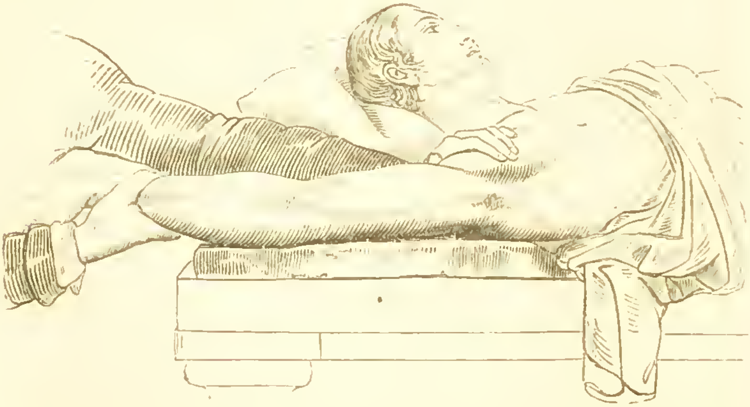
1. By *simple extension.* A jack-towel is to be passed round the chest, both above and below the shoulder, so as to fix the scapula well; this should be held firmly. Another should be fastened round the arm, above the elbow, by means of the knot called the *clove hitch* represented in the next figure. Extension should then be made by

the latter; the patient sitting on the floor, his elbow being bent, and the humerus being raised and carried forwards, so as to relax the deltoid, supra-spinatus, and biceps muscles. When extension has been made for some minutes, the surgeon should lift the head of the bone, and it will frequently return with a snap.



2. The extension may be performed in the same direction with the aid of the *pulleys;* recollecting always that they are not to be used in order to exert *greater force*, but to exert it *more equably*. A damp bandage should be applied round the elbow to protect the skin before the strap of the pulleys is attached.

3. By *the heel in the axilla*. The patient lies down on a bed, and the surgeon sits on the edge. He puts his heel (without his boot)* into the axilla, to press the head of the bone upwards and outwards, and at the same time pulls the limb downwards by means of a towel fastened round the elbow.



4. According to the method invented by Mr. White, of Manchester, and revived by Malgaigne, the patient lies down, and the surgeon sits behind him. The scapula is well fixed, by placing one hand upon

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* A case is related by Dr. Warren, of Boston, in which a person made a violent attempt to reduce a dislocation by putting the heel of his boot into the axilla. The result was a rupture of the axillary artery. Vide Ranking's Abstract, vol. iii. p. 43.

the shoulder, or by passing a jack-towel over the shoulder and fixing it to the opposite corner of the bed; then the arm is raised from the side, and drawn straight up by the head, till the bone is thus elevated into its socket.

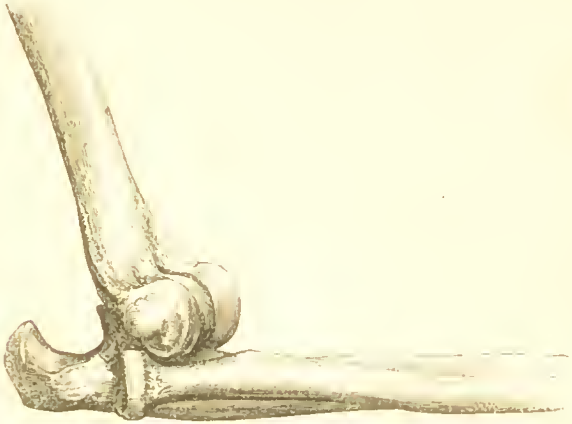
5. By the *knee in the axilla.* The patient being seated in a chair, the surgeon places one of his knees in the axilla, resting the foot on the chair. He then puts one hand on the shoulder to fix the scapula, and with the other depresses the elbow over his knee.

The dislocation *forwards* may be reduced by the *heel in the axilla* or by *extension* with the jack-towel or pulley. But the extension must be made in a direction downwards and backwards. For the dislocation backwards, extension should be made forwards. The partial dislocation forwards may be reduced by simple extension.

After reduction a pad should be placed in the axilla, and the arm and shoulder be supported for some days with a figure of 8 bandage, a few turns of which should confine the arm to the trunk. Warm fomentations—perhaps leeches—and subsequently frictions, will relieve the pain and swelling. The more weak and flabby the patient, or the oftener the dislocation has occurred, the longer will confinement be necessary, in order to allow of a complete consolidation of the ruptured ligament. In fact, when the dislocation has occurred more than twice, an apparatus consisting of a clavicle bandage, with a broad band round the head of the humerus, should be worn for some months, so as to restrain the motions of the joint.

It has been before directed that this and all other dislocations should be reduced as soon as possible after the injury. If the reduction has been delayed till the muscles have fixed the part, and the patient is robust, it may be necessary to bleed or administer tartar emetic or chloroform, and to make a long, slow, and gentle, but unremitting extension by the pulleys. When the extension has been continued some time, the surgeon may gently rotate the limb by the fore-arm, or lift the head of the bone. If the dislocation has lasted some time, there will be still greater necessity for a tedious operation. Sir A. Cooper's opinion is, that a reduction ought not to be attempted after three months. But the criterion which Mr. B. Cooper has proposed is a better one; and that is, the degree in which the arm has been exercised and the amount of useful motion which it has acquired in its new situation; for, in proportion as the head of the bone has formed for itself a new socket, so most likely will the old socket have become unfit for its reception again. There are numerous instances on record, of the most disastrous and even fatal results that have ensued from attempts at reduction at a later period; the integuments and muscles have been lacerated; abscess has formed, and been followed by anchylosis of the joint; nay, even the whole side has been palsied from injury to the cervical vertebræ, and the axillary artery has been torn across.

Injuries of the shoulder-joint are liable to be followed by various obstinate and intractable affections. Sometimes the deltoid muscle wastes away, owing probably to injury of the circumflex nerve. Violent spasms and neuralgic pains of the arm sometimes occur from injury to the other nerves; and there are some cases in which rupture or displacement of the long tendon of the biceps is the source of continued impairment of motion; and, together with displacement of this tendon, the head of the humerus has been known to be partially dislocated upwards.*



IV. DISLOCATION OF THE ELBOW presents six varieties. Both radius and ulna may be dislocated, 1. simply backwards; or, 2. backwards and outwards; or, 3. backwards and inwards. 4. The ulna by itself may be dislocated backwards; and the radius by itself either, 5. backwards, or, 6. forwards.

1. When both radius and ulna are dislocated *backwards*, the elbow is bent at a right angle, and is immoveable. The olecranon projects much behind; a hollow can be felt at each side of it, corresponding to the great sigmoid cavity; and the trochlea of the humerus forms a hard protuberance in front. The coronoid process rests in that fossa of the humerus which naturally contains the olecranon.

2. In dislocation of *both bones backwards and outwards*, the coronoid process is thrown behind the external condyle; and in addition to the preceding symptoms, the head of the radius can be very plainly felt on the outer side of the joint.

(3.) The dislocation *backwards and inwards* is known by a great projection of the outer condyle, in addition to the symptoms of the first variety.

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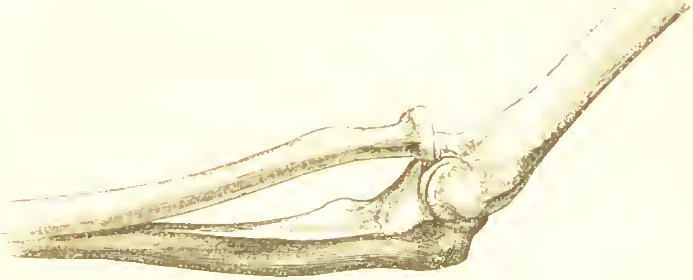
* See a paper by Mr. Stanley on Rupture of the Biceps Tendon, in the Lond. Med. Gaz. vol. iii.; and case of partial dislocation of the humerus upwards, by Mr. Soden, in Med. Chir. Trans. for 1841. Some morbid changes often attributed to injury, such as atrophy or laceration of the capsular tendons, are more probably produced by chronic rheumatic arthritis.

4. In *dislocation backwards* of the *ulna solely*, the olecranon is much projected backwards; the elbow is immoveably bent at right angles, and the fore-arm is much twisted and pronated.

The *treatment* of these four varieties is the same. Reduction may be effected, *first*, by fixing the lower end of the humerus whilst the fore-arm is drawn forwards; or *secondly*, the surgeon may bend the elbow forcibly over his knee; or *thirdly* (if the case be quite recent), he may forcibly straighten the arm, so as to make the tendon of the biceps pull the *trochlea* of the humerus back into its place.

5. The head of the *radius alone* may be *dislocated forwards*, being thrown against the external condyle. The elbow is slightly bent, and, in bending it more, the head of the radius can be felt to strike against the front of the humerus.



Treatment.—Simple extension from the hand, the elbow being straight.

6. Dislocation of the *radius backwards* is very rare. The head of the bone can be felt behind the outer condyle. *Reduced* by simply bending the arm, which should be kept bent for three weeks.

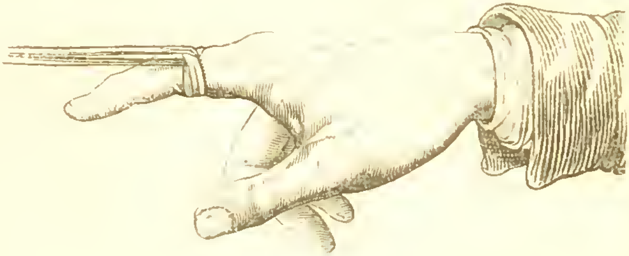
Diagnosis.—These dislocations of the elbow may be distinguished from fractures of the lower extremity of the humerus, 1. by the impaired mobility of the joint, and by the absence of crepitus; 2. by measuring the length of the humerus from its condyles to the shoulder; which, in dislocation, will be equal to that of the sound limb, but will be diminished in fracture of the lower extremity of the humerus. But when it is considered that these six dislocations may be combined with various fractures of the condyles of the humerus and of the bones of the fore-arm, it will be admitted that the injuries of the elbow present a sufficiently wide and complicated field of study.

V. Dislocations of the Wrist may readily be distinguished by the altered position of the hand, which is thrown either backwards or forwards if both bones be dislocated, or twisted if only one be displaced,—and by the alteration of the natural relative position of the styloid processes of the radius and ulna with the bones of the carpus. They are reduced by simple extension.*

VI. Dislocations of the Hand. — The *os magnum* and *os cuneiforme* are sometimes partially dislocated through relaxation of their ligaments, and form projections at the back of the hand, which must not be mistaken for ganglia. Mr. Fergusson has also known the os pisiforme dislocated by the action of the flexor carpi ulnaris muscle.

Treatment.—Cold affusion, friction, and mechanical support.

Dislocations of the *thumb*, *fingers*, and *toes*, are difficult of reduction in consequence of the strength and tightness of their lateral ligaments, and the small size of the part from which extension can be made.



A firm hold may be obtained by means of a piece of tape fastened with the knot called the *clove hitch*, represented in this figure. But it is a good plan to place a part of the tape round the head of the dislocated bone, so as to pull it straight forwards into its place. Extension should be made towards the palm, so as to relax the flexor muscles. But "before the reduction has been effected," says Mr. Liston, "it has been in some cases even found necessary to divide one of the ligaments; the external is most easily reached; it is cut across by introducing a narrow-bladed and lancet-pointed knife through the skin at some distance, and directing its edge against the resisting part."

In compound dislocation of the first phalanx of the thumb on the metacarpal bone, the head of the phalanx should be sawn off, before attempting reduction; and in compound dislocation of the second phalanx, it is better to saw off the head of the first.

VII. Dislocations of the Ribs.—The costal cartilages may be torn from the extremity of the ribs, or from the sternum;—and the posterior extremity of the ribs, may be dislocated from the spine by falls on the back; but these accidents are very rare. A case is related in which the heads of the last two ribs were driven forwards from the spine, in a boy of eleven, by a violent blow on the back; abscess formed, and the case terminated fatally.* The body of the sternum has also been dislocated in front of the manubrium, and the ensiform cartilage is sometimes separated. In all these cases, the same local and constitutional treatment must be adopted that was prescribed for fracture.

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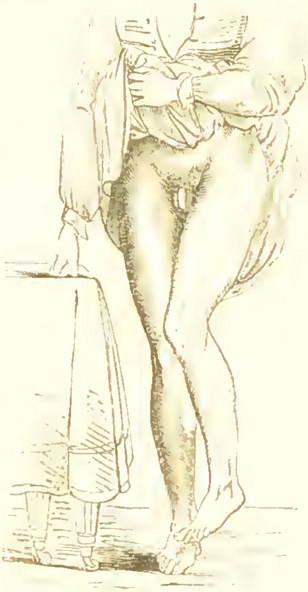
* Dupuytren taught that these dislocations are extremely rare, or, in fact, almost impossible; and that fractures of the lower extremity of the radius are generally mistaken for them. But the experience of English surgeons shows that real dislocation, without any fracture, is not by any means uncommon. See a very carefully reported case in the Lond. Med. Gaz., June 17th, 1843.

VIII. Dislocations of the Hip-Joint.—There are four principal varieties of this dislocation. 1st. The dislocation upwards; in which the head of the bone is thrown on the dorsum ilii. 2dly, The dislocation backwards on the sciatic notch; 3rdly, downwards, on the obturator externus muscle; and 4thly, forwards, on the os pubis. Besides which there are two or three others that are exceedingly rare.



1. Dislocation *upwards on the dorsum ilii* is the most frequent.

Symptoms.—The limb is from an inch and a half to two inches and a half shorter than the other; the toes rest on the opposite instep; the knee is turned inwards, and is a little advanced upon the other; the limb can be slightly bent across the other, but cannot be moved outwards; the trochanter is less prominent than the other, and nearer the spine of the ilium; and if the patient is thin, and there is no swelling, the head of the bone can be felt in its new situation.

Diagnosis.—Fracture of the *cervix femoris* may be distinguished from this dislocation by the circumstance that the limb can be freely moved in any direction, although with some pain; that it is turned outwards instead of inwards; and that it can be drawn to its proper length by moderate extension, but becomes shortened again as soon as the extension is discontinued: whereas in dislocation, it requires a forcible extension to restore the limb to its proper length and shape; but when once the head of the bone is replaced in its socket, it remains there.†

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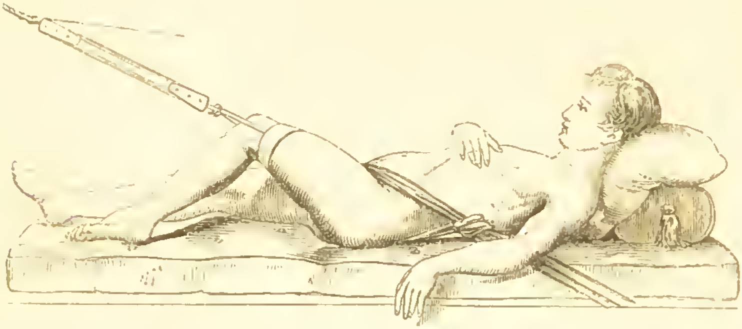
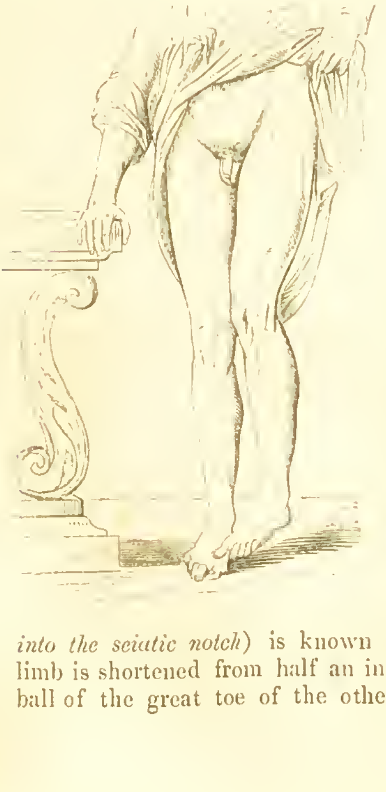
* Dublin Med. Press, 3rd Feb. 1841.

† There are a few cases on record of fracture of the upper extremity of the femur, in which a portion of the great trochanter was broken off, and drawn by the muscles backwards on the dorsum ilii, into the position usually occupied by the head of the bone when dislocated; so that the nature of the accident was obscure.

Treatment.—In the first place, it will be requisite to diminish the force of the muscles by chloroform, or else by bleeding; by immersion in a hot bath; and by the exhibition of half a grain of tartar emetic every ten minutes, continued till the patient feels nauseated and powerless. Then he should be wrapped in a blanket, and placed on his back on a table; a leathern girth or strong towel should be passed round the upper part of the thigh, so as to bear firmly against the perinæum and crista ilii, as represented in the foregoing cut which was sketched from nature by Mr. W. Bagg; and this should be attached to a ring or hook securely fastened into the wall or floor. A linen roller should next be applied to the lower part of the thigh, and over it the strap belonging to the pulleys; which last are to be fixed to the wall or some other firm object. Then extension is to be made in such a direction as *to draw the thigh across the opposite, a little above the knee.* After a little time, the surgeon should gently rotate the limb, or lift the upper part of it, and the head of the bone will probably return to the acetabulum. The patient should then be carefully moved to bed with his thighs tied together.

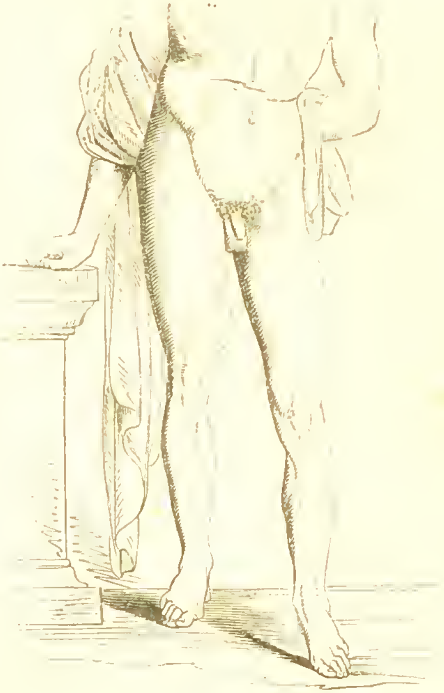




2. The dislocation *backwards* (commonly called the dislocation *into the sciatic notch*) is known by the following symptoms. The limb is shortened from half an inch to an inch; the toes rest on the ball of the great toe of the other foot; the knee is advanced and

turned inwards, but not so much as in the last case; the trochanter is rather behind its natural position, and the head of the bone can scarcely be felt.

Treatment.—Pulleys are required, as in the last case; but the patient should be placed on the sound side, and the limb be drawn across the middle of the opposite thigh. After a little while the upper part of the limb should be lifted by means of a napkin, so as to raise the head of the bone over the edge of the acetabulum,* the thigh being at the same time rotated outwards.



3. In the dislocation *downwards*, the head of the bone is thrown into the *thyroid foramen*, or on the *obturator externus*. The *symptoms* are as follow:—the limb is lengthened one or two inches; it is drawn away from the other; the toes point downwards and directly forwards; and the body is bent forwards, because the psoas muscle is on the stretch.

Treatment.—The object is to draw the head of the bone outwards, and rather upwards. There are two methods of effecting this. In the first place, the patient may be laid on his back on a bed, with one of the bedposts between his thighs, and close up to the perinæum. Then the foot may be carried inwards, across the median line; so that the bed-post, acting as a fulcrum, may throw the head of the femur outwards. But the foot must not be *raised*, otherwise the head of the femur may slip round under the acetabulum into the sciatic notch. (2.) Or the pelvis may be fixed by straps, and the pulleys be applied to the upper part of the thigh, to draw it outwards: whilst the knee is at the same time pulled downwards and inwards.

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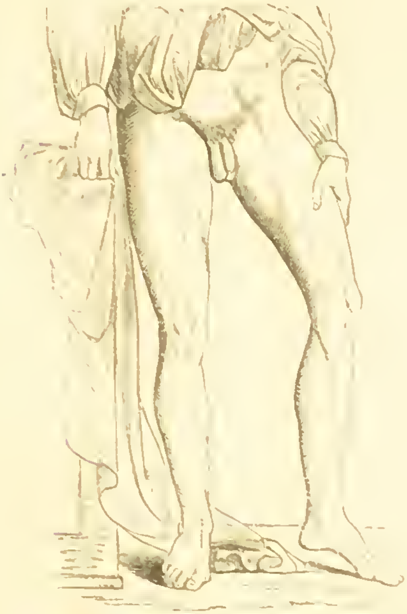
* The above account is condensed from Sir A. Cooper, op. cit. chap. ii. sect. iv. Mr. Richard Quain has published (Med. Chir. Trans. vol. xxxi.) an account of a careful dissection of a recent case of this injury, and of experiments made to determine the exact relation of the visible deformity, to the true position of the head of the bone; and has concluded that in the ordinary form of this dislocation, the head of the femur does not reach the sciatic notch, but is lodged immediately behind the acetabulum, over the base of the ischiatic spine, and opposite to a small part of each of the two sacro-sciatic foramina; that the advanced position of the displaced limb at the knee, and the situation of the foot with "the toe resting against the great toe of the other foot" are not necessarily present; that during the extension the thigh should be at a right angle with the abdomen, and in a state of abduction; that the extending force should be applied above the knee; and that this joint should be bent in order to relax the sciatic nerve, which runs either immediately before or behind the displaced head of the bone.



4. In the dislocation *upwards and forwards* (on the pubes), the limb is shortened about an inch; very moveable; it is drawn away from the other, and the foot points directly outwards; the head of the bone may be plainly felt below Poupart's ligament; and by this circumstance this dislocation may be distinguished from fracture of the cervix femoris.

Treatment.—The patient is to be laid on the sound side; extension should be made with the pulleys in a direction backwards and outwards; and after it has been continued a little time, the head of the bone should be lifted over the edge of the acetabulum by means of a napkin.

Sir Astley Cooper has decided that eight weeks is the latest period after which it is justifiable to attempt the reduction of a dislocated hip, except in persons of extremely relaxed fibre or of advanced age; and numerous instances are on record of death from abscesses or phlebitis, occasioned by violent extension at a later period.

With respect to the relative frequency of these dislocations, Sir A. Cooper believed that out of twenty cases, twelve would be on the dorsum ilii, five in the ischiatic notch, two in the foramen ovale, and one on the pubes.*

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* These dislocations generally happen to adults. In very old people it is more common for the cervix femoris to give way. They are also rarely met with in children, although Sir A. Cooper relates one case which happened to a boy of seven; Mr. Travers, Junr. one to a boy of five; and the late Mr. Place, of Wim-

It may be added, that in elderly weakly persons these dislocations may be conveniently reduced by means of the surgeon's foot pressing on the perineum, whilst extension and rotation of the limb are effected by assistants.*

UNUSUAL DISLOCATIONS.—Besides the above four varieties, a dislocation directly downwards on the tuberosity of the ischium; one directly backwards on the spine of the ischium; and one directly upwards on the space between the anterior spinous processes of the ilium, have been known to occur, although very rarely. In a case of dislocation directly downwards, recorded by Mr. Keate, the limb was lengthened three inches and a half, and was fixed and everted; the trochanter was sunk; and the head of the bone, close to and on a level with the tuberosity of the ischium, where it was capable of being moved under the finger. In a case of dislocation on the spine of the ischium, which happened in the practice of Mr. Earle, at St. Bartholomew's, the limb was lengthened about half an inch; it was neither everted nor inverted, but if anything the latter; there seemed to be a great vacuity in front of the hip; the edges of the sartorius and tensor vaginæ femoris could be plainly felt, and a cavity behind them; and the trochanter was further back, and not so prominent as usual. But the dislocation directly upwards is the most common of these unusual forms. In a case that was examined by Mr. Travers, jun. some time after the accident, the limb was completely everted and slightly moveable; and the neck of the bone lay between the two anterior spinous processes of the ilium; so that when the patient was erect, the limb seemed to be slung or suspended from this point. The diagnosis must in such cases be guided by an attentive examination of the deformity that is present, and by the absence of any symptoms of fracture. The reduction must be effected by extension, made in such a direction as seems most likely to bring the head of the bone into its socket.†

IX. DISLOCATIONS OF THE KNEE.—Dislocation of the *tibia from the femur* is not very common; and, when it does occur, is rarely complete. In most cases the tibia is thrown backwards towards the ham. The deformity and impediment to motion will enable the practitioner to distinguish the accident; and if there be no complication requiring amputation, the displacement must be rectified by simple extension, and the knee be kept at rest till inflammatory symptoms have subsided. There often remains a permanent inability to keep the joint firm in the straight position.

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borne, was good enough to communicate to the author the particulars of a case of dislocation on the dorsum ilii happening to a boy of ten.

* South's Chelius, vol. i. p. 801.

† Vide a paper on Rare Dislocations of the Hip-Joint, in the Med. Chir. Trans. vol. xx. by Mr. Travers, jun. Guy's Hosp. Rep. vol. i., Keate, Med. Gaz. vol. x.; a case of dislocation directly upwards, Lancet, May 15th, 1841; Mr. Earle's case, Lancet, vol. xi. p. 159; case of dislocation downwards and backwards (with dissection and drawing) by Mr. Wormald, Med. Gaz. 28th Jan. 1837.

DISLOCATION OF THE PATELLA may occur either inwards or outwards; more frequently in the latter direction. The symptoms are, that the knee cannot be bent, and that the bone can be felt in its new situation. This dislocation may be caused either by mechanical violence, or by a sudden contraction of the extensors of the thigh. It mostly happens to knock-kneed, flabby people. There is, in general, no difficulty in reducing it by means of the finger and thumb, if the knee is straight and the leg raised. There is one variety of this dislocation, however, in which the patella is turned round on its long axis, so that its outer edge lies immediately under the skin, and its inner edge rests on the trochlea of the femur, where it is as firmly fixed as if screwed down. In one instance, the surgeon was unable to reduce it by any means, even although he divided the ligamentum patellæ, and cut through the quadriceps at its insertion into the patella; and the patient died in eleven months, in consequence of his wounding the joint. Mr. Mayo relates a similar case, in which he succeeded in overcoming the difficulty by bending the knee to the utmost, so that the patella was drawn out of the groove in which it was lodged.*

The patella is dislocated upwards after rupture of its tendon by the extensor muscles. This must be treated as fracture of the patella; but it is very rare.

PARTIAL DISLOCATION OF THE SEMILUNAR CARTILAGES.—During sudden twists of the knee-joint, the semilunar cartilages may slip out of their proper position, and become wedged in between the tibia and femur. The symptoms are sudden extreme sickening pain, and inability to stand, or to straighten the limb. This accident generally happens to people of relaxed habits, and when it has once happened is very liable to recur. In a case dissected by Mr. Fergusson, the external semilunar cartilage was found to be torn from its connexion with the tibia, except just at its extremities. The best way of restoring the part to its place, is to place the patient on the affected side, with the knee bent, and rotate the tibia gently in its axis. Should this not succeed, says Mr. Vincent, "the only thing is to keep the patient in bed, and in some of his slumbers all will come right" of itself. The patient should put on an elastic knee-cap before he moves about.

DISLOCATION OF THE HEAD OF THE FIBULA is of very unfrequent occurrence; except as a consequence of relaxation of the ligaments from weakness, which must be treated by blisters, and bandages, with a pad to press on the head of the bone. There are two cases of it, caused by violence, in Sir Astley Cooper's work; the head of the bone could be felt to pass more backwards than natural, and could be moved by the finger. The pad of a tourniquet was employed to keep it in its place.

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* Three cases are related in Sir A. Cooper; and a similar one in Sir G. Ballingall's Military Surgery. Mr. Vincent says, that the obstinate resistance which this dislocation offers is owing to the fact that when the limb is straight the extensor muscles, which are the retaining force, are in their position of strongest action; when the knee is bent they are in their weakest position. Op. cit. p. 74.

X. Dislocation of the Ankle is generally caused by jumps from great heights or from carriages in motion, and may occur in four directions. 1. Dislocation of the *tibia inwards* is the most common. It is attended with fracture of the lower third of the fibula, and may be easily known by the sole of the foot turning outwards; its inner edge turning downwards; and great projection of the internal malleolus. 2. Dislocation of the *tibia and fibula outwards* is attended with fracture of the internal malleolus, and may be known by the sole of the foot turning inwards. 3. In the dislocation *forwards*, the foot appears shortened, and the heel lengthened, and the toes pointed downwards. There is also a partial dislocation forwards, in which the tibia is only half displaced from its articulation with the astragalus, the fibula being also broken; the foot appears shortened, and immovable, and the heel cannot be brought to the ground. 4. A dislocation backwards has been described; but it must be excessively rare, as Sir A. Cooper never saw it. There is a case of it described by Mr. Colles, which, however, was probably one of transverse fracture of the tibia and fibula just above the joint, with displacement backwards. The fracture of the fibula about three inches above the outer malleolus, which accompanies the dislocation inwards, is commonly called Pott's fracture.

Treatment.—The patient must be laid on the affected side, and the knee must be bent (to relax the gastrocnemius), and be firmly held by an assistant. The surgeon must then grasp the instep with one hand, and the heel with the other, and make extension (aided by pressure on the head of the tibia), till he has restored the natural shape and mobility of the parts. Then the limb must be *put up* with a splint on each side, in the same manner as a fracture of the lower part of the leg, taking care to keep the great toe in its proper line with the patella.

Compound Dislocation of the ankle joint is by far the most frequent example of that kind of injury. If the wound in the integuments does not heal by the first intention, the joint inflames; suppuration occurs in about five days; much of the cartilage is destroyed by ulceration; at last the wound is filled with granulations, and the patient recovers a tolerably good use of the foot in from two to twelve months. The first thing to be done is, to wash away all dirt with warm water; to remove any shattered pieces of bone gently with the fingers, and then to reduce the bone to its place; slightly enlarging the wound in the skin if necessary, in order to effect this without violence. If it is very difficult to return the end of the tibia, or if it is fractured obliquely, or much shattered, it is better to saw it off; as the patient will have quite as good use of the limb afterwards. Then the external wound should be closed with a bit of lint dipped in the patient's blood, and the leg be secured with a tailed bandage and splints, and be wetted with an evaporating lotion. Care must be taken not to let the foot be pointed, nor be turned to either side. The remaining treatment is the same as that of compound fracture; and the rules which are given as to the necessity of amputation, are the same in both cases.

XI. Dislocations of the Foot.—The most important of these are the dislocations of the astragalus, which may be separated from its connexion with the os naviculare and os calcis in various ways. Sometimes it is thrown inwards, so as to rest on the inner surface of the os calcis; and in this case, there appears an unusual projection below the inner ankle, and a corresponding depression below the outer one, and the whole foot seems displaced outwards. Sometimes it is thrown outwards; and then the foot seems to be displaced inwards. If these dislocations are simple, reduction should be immediately attempted by extension, and the pulleys and chloroform will be needed; although the attempt will often be unsuccessful. The tendo Achillis may be divided, if it seems the chief obstacle to reduction. If the dislocation is compound, and the bone cannot be replaced, or if it is much shattered, it may be dissected out. In these two dislocations, the astragalus is separated from the other tarsal bones, but preserves its connexions with the tibia and fibula, so that they may be regarded merely as varieties of dislocation of the ankle joint, in which the tibia and fibula carry the astragalus with them in their displacement. It may, however, be completely shot out from under the tibia, and lie under the skin of the outer side of the foot. And lastly, it may in the same way be dislocated backwards; projecting behind the ankle joint, and pushing the tendo Achillis backwards. This displacement, if only partial, will be extremely difficult to rectify, and, if complete, it will most likely be impossible.*

Besides these, the five anterior tarsal bones may be dislocated from the os calcis and astragalus. The cuneiform bones may be dislocated upwards from the navicular; the metatarsal bones from the tarsal, and the toes from the metatarsal. In any of these cases, the proper position of the parts must be restored as much as possible by pressure and extension, and be preserved by bandages; but reduction will often be very difficult, if not impossible.

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* For cases of the dislocation of the astragalus backwards, see a paper by Mr. B. Phillips, Med. Gaz. vol. xiv. p. 596, and Fergusson's Practical Surgery. See also Mr. Cross's case of dislocation of astragalus reduced by dividing the tendo Achillis, quoted in Ranking, vol. ix. p. 140; Campbell de Morgan, B. Phillips, Lonsdale and others, Lancet, 1849, vol. ii. p. 618.

CHAPTER VII.

OF INJURIES AND DISEASES OF ARTERIES.

SECTION I.—OF WOUNDS OF ARTERIES.

Symptoms.—An artery may be known to be wounded by the flow of blood, which is profuse, of a florid colour, and ejected *per saltum;* that is to say, in repeated jets, corresponding to each beat of the pulse.

Pathology.—It must be evident that the bleeding from wounded arteries must necessarily be profuse and dangerous, because from the nature of their coats they remain open and patulous, and do not collapse as the veins do; and because of the perpetual current of blood impelled by the heart. Hence it is important to study the means by which arterial hæmorrhage is at first arrested, and those by which the wound is afterwards permanently closed; as well as the different effects of different kinds of wounds.

There are four processes employed by nature for the temporary suppression of arterial hæmorrhage. In the first place, the divided orifice *contracts* more or less; and 2ndly, it *retracts* into its cellular sheath; 3rdly, the blood coagulates in the sheath of the artery and in the wound, and thus obstructs the further exit of it; and 4thly, the faintness induced by hæmorrhage, both checks the current of blood from the heart, and gives it an increased disposition to coagulate.

Now if a *very large* artery, such as the femoral or subclavian, is wounded, and if the aperture in it is large, and the flow of blood is in no manner opposed, the loss of blood will be so rapid as to occasion death almost instantaneously. But if the wound in the artery is very small, it may be closed firmly by coagulated blood during syncope, and the patient may survive.*

If the artery is of the second order, as the humeral or tibial, the bleeding will most probably cease for a time through the influence of the four processes that we have just spoken of. But in the course of some hours, when the faintness has passed off, and the heart beats strongly again, the coagula in the orifice of the vessel will most probably be dislodged, and the bleeding will recur again and again, so that the patient will very likely die of it, unless it be checked by art. In some cases, however, the orifice of the vessel may become permanently closed in the way that we shall mention directly.

If the wounded artery is small, as the digital or temporal, the hæmorrhage, though pretty brisk for a time, will generally soon cease spontaneously and permanently in the following manner:—

Supposing the artery to have been *completely divided;* its orifices will *contract*, and will *retract* into the sheath, which also will be plugged with coagula. Thus then the bleeding is checked for a time. But shortly the adhesive inflammation is set up; a yellowish green, tough lymph is effused, and fills up the contracted orifice of the vessel; that part of the artery which intervenes between the wound and the nearest branch, gradually contracts in the shape of the neck of a champagne bottle; the blood coagulates within it, adheres to its internal surface, and becomes organized into a cellulo-fibrous tissue; and, finally, the impervious portion of the artery degenerates into a fibrous cord, and is gradually absorbed.

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* A case is quoted in Forbes' Rev. vol. vii. p. 254, in which a patient lived a year after a wound in the ascending aorta.

It must be evident that a *puncture or partial division* of an artery, is much more dangerous than complete division; because the two principal natural means of arresting hæmorrhage, namely, the *contraction* and *retraction*, are prevented; and the bleeding can only be obstructed by the coagulated blood in the wound. Under these circumstances, three things may happen. In the first place, the aperture, if longitudinal or very small, may in favourable cases be closed by the adhesive inflammation, the artery remaining pervious. The uniting lymph, however, is very liable to be dilated into a *false aneurism.* Or, secondly, the channel of the artery may be obliterated by lymph or coagulated blood. Or, thirdly, bleeding may recur perpetually, till the undivided part of the vessel ulcerates, or is divided by art. From these details may easily be gathered the reason why, when a small artery has been partially divided (as the temporal in arteriotomy), it is judicious to divide it completely.

When an artery is *torn across*, it contracts almost immediately, and becomes quite impervious, so that an arm or leg may be torn off by a shot or by machinery, without any loss of blood from the axillary or tibial arteries. For this reason, there is no hæmorrhage from the umbilical cord of young animals, which is either torn or bitten through by the mother. Lastly, it will be readily seen that division of arteries which are diseased, or which are situated in condensed and inflamed tissues, so that they cannot contract or retract, will be followed by profuse bleeding.

Treatment.— The first indication is to stop the flow of blood, until measures can be adopted for arresting it permanently. For this purpose, if the wound is a small one, and there is bone underneath, as in the hand, forearm, or temple, the surgeon may make firm pressure on it with his thumb or finger:—if the wound is wide and deep, he should poke his fore-finger into it, wipe away all clots, and press with the point of the finger on the exact spot the blood issues from, or he may seize the bleeding orifice with his finger and thumb; in other cases, the blood may be checked by pressing the trunk of the artery above, against a bone; or by applying the *tourniquet;** or in default of that by passing a handkerchief round the limb, and twisting it tightly with a stick. The *permanent measures* are ligature—torsion—pressure—cold, and styptics.

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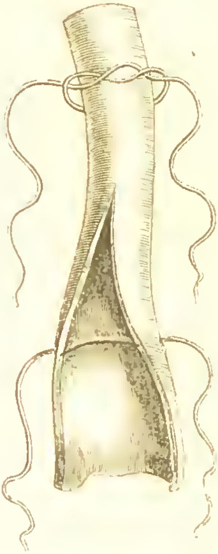
* The tourniquet is described in the chapter on Amputations.

Ligature.—When a ligature is tied tightly upon an artery, it divides the middle and internal coats, leaving the external or cellular coat enclosed in the knot. Then the following series of phenomena occurs. The cut edges of the internal coats unite by adhesion; the blood between the point tied and the nearest collateral branch coagulates and adheres to the lining membrane; the ring of the cellular coat enclosed in the ligature ulcerates; the ligature comes away in from five to twenty-one days, (sooner or later, according to the size of the vessel), and, finally, that portion of the artery, which is filled with coagulum shrinks into a fibrous cord.



Now it must be observed that the efficacy of the ligature depends on two things. 1st. On the *adhesion of the cut surfaces* of the internal coats of the artery; and in order to promote this, the *ligature should be small and round*, so as to divide them smoothly and evenly,* and in tying it, the artery should be disturbed as little as possible; in order not to tear through the vessels which it receives from its sheath, and on which the nutrition of its coats, and their capacity for adhesion, depend.

2ndly. On the *adhesion* and *organization of the blood* in the artery between the part tied and the nearest branch.

Hence the rule is generally given, *not to tie an artery immediately below a branch*, if it can be avoided.†

When, however, the artery is *diseased and brittle*, the ligature should be large, and not tied so tightly; otherwise it may cut through entirely; or else a small portion of the adjoining tissue must be included in the knot.

The manner of tying an artery is simple enough. If the wound is large and open, as after an amputation, the orifice will generally be readily seen, and very likely will project a little. It should be taken hold of with a forceps, and be gently drawn out, and then an assistant should tie a ligature round it as tightly and smoothly as possible in a double or treble knot. If the bleeding orifice cannot be drawn out with the forceps, it may be transfixed with the *tenaculum;* but in some cases, where it is deeply seated or cannot be found, or is contained in a dense consolidated tissue, it is necessary to pass a curved *needle and ligature* through a considerable thickness of the flesh, and tie it up altogether. This, however, should never be done if it can be avoided. In all cases where it is possible, the artery alone should be included in the ligature. After tying, one end of the ligature should be cut off, and the other be made to hang out of the wound.

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* J. F. D. Jones, M.D., Treatise on Hæmorrhage and the Ligature. Lond. 1805.

† The author does not believe this circumstance to be of such great importance as it is sometimes thought: and agrees with Mr. Porter, that when secondary hæmorrhage occurs, it is more frequently owing to some morbid state of the artery or of the system, which has prevented the healthy process of obliteration, than to the place or mode of application of the ligature. Vide Porter on Aneurism.

When an artery is completely divided, it is necessary to tie both orifices; and if it is wounded, but not divided, a ligature must be placed by an aneurism needle both immediately below and above the wounded part. It is necessary to observe, that in all cases, when it is possible, *a wounded artery must be tied at the wounded part;* and not in the trunk above.

But here the question may be asked, supposing that there is a wound of an artery situated at a great depth under muscles; or that the wound is in an inflamed or sloughy state; or that the adjacent parts are so infiltrated with blood that it must be extremely difficult to find the wounded vessel; would it not answer the purpose to tie the main trunk of the limb at some place between the wound and the heart, where it can be done easily? just, in fact, as an aneurism is treated?

The answer is, certainly not:—the artery should be secured by two ligatures, one immediately above, and one immediately below the wound; and should not be tied in the trunk above: and the reasons for this rule must be evident enough from the following considerations. 1. A trunk may be tied that has no connection with the branch wounded. Thus, in wounds of the upper part of the neck, the trunk of the common carotid has been tied many times when the bleeding vessel has been the *vertebral.* 2. There is the possibility of high division, or some other unusual distribution of the arteries. 3. The limb below must be supplied with blood, by collateral circulation, else it will mortify. "But whenever," to use Mr. Guthrie's words, "this collateral circulation is sufficient to maintain the life of the limb, blood must pass into the artery below the wound, and must, as a general rule, pass up and out through the lower end of the divided artery." 4. Gangrene is very liable to follow if a ligature be placed high up in the thigh, in consequence of a wound. 5. The lower end of a wounded artery is not so quickly and effectually closed by a natural process of cure, as the upper, and is exceedingly liable to yield to the blood that regurgitates into it from below, and to bleed again and again until closed by ligature.

Wherever, therefore, an artery may be wounded, it should be secured by two ligatures, if practicable. When the wound in the skin is not sufficiently gaping to expose the bleeding part, a bougie or probe should be first passed down as a guide to it, and then it should be laid open by a sufficiently long incision upwards and downwards. But if it is clear that a vessel is wounded by a stab from the remote side of the limb (as if the femoral is pierced by a wound at the back of the thigh), a bougie may be passed in, as before, as a guide for the incisions, but the operator may lay the vessel bare at the side where it is most easily accessible.*

2. *Torsion* is performed by drawing out the vessel, fixing it by a pair of forceps a quarter of an inch from the end, and then twisting the end round and round till it will not untwist itself. There is no English authority for applying this method to large arteries, but it may be useful enough when many minor vessels bleed after the extirpation of a tumour.

3. *Pressure* is a means of suppressing hæmorrhage that may be resorted to either when the ligature is deemed unnecessary, or when it cannot be applied. Thus it is applicable to wounded arteries of small size situated immediately over bones; as the temporal; or to arteries that cannot be tied because they lie very deeply; as the external carotid in the parotid gland; or to arteries that are so diseased that a ligature will not hold. The pressure must be confined as much as possible to the bleeding orifice, and should be effected by a *graduated compress; i.e.*, one composed of several pieces gradually decreasing in size, the smallest being on the wound. It is also a good plan to apply pressure to the course of the trunk, above the wound. Moreover, when pressure is to be relied upon, the whole limb, including the fingers or toes, should be accurately bandaged from its extremity, in order to diminish its entire circulation, and it should be placed in a raised position. When the palmar arch is wounded, one compress may be placed on the wound, and another on the back of the hand; a paper knife or strong slip of wood may then be laid on each compress transversely across the hand, and their ends be firmly tied together.

4. *Cold* is applicable to cases of bleeding from numerous small vessels. If there is a general oozing from a stump after amputation, a cloth dipped in cold water may be twisted over the face of it. Hæmorrhages from the vagina and rectum may sometimes be checked by dilating them with the speculum and exposing them to the cold air.

5. *Styptics* are of various kinds. 1. Some of them check hæmorrhage by opposing a mechanical obstacle to the exit of blood; as the *agaric*, and other porous substances which entangle it: 2, others act by coagulating the blood; or 3, by causing contraction of the bleeding vessels; or 4, by exciting the adhesive inflammation and formation of granulations. The tinct. ferri mur.; a saturated solution of alum; turpentine, creosote, the nitrate of silver, and the *matico* leaf, are the best. They are applicable to the same cases as cold and pressure; that is, when the bleeding vessels are very numerous and small. The *actual cautery*, which is the most potent styptic of all, has two operations. If the iron be *red hot*, it stops bleeding mechanically by burn-

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* Guthrie on Diseases and Injuries of Arteries, p. 254; Lond. 1830. Lectures in Lancet, 1849, vol. i.

ing up the orifices of the vessels, but the bleeding is liable to return when the eschar separates. It is better, therefore, to use the iron at a *black heat*, for it then excites the adhesive inflammation; and is very efficacious for arteries that either cannot be tied, or that are too diseased to hold the ligature. A *pinch with the forceps* will often cause small vessels to cease bleeding. Many obstinate hæmorrhages from small vessels cease when the wound is cleared of coagulum, and the bleeding part exposed to the air.

Medical Treatment.—In cases of arterial hæmorrhage, which there is any difficulty in restraining by ligature or otherwise, it will be necessary to keep the patient in the recumbent posture, and to tranquillize the heart's action by opium. The diet should consist of milk, broth, and other substances that nourish without stimulating.

Supposing that so great loss of blood has taken place, as to endanger the patient's life, the head must be kept low; beef-tea with brandy be given frequently by spoonfuls, and opium in small doses every three or four hours. In a desperate case, where life would evidently be lost without it, eight or ten ounces of blood should be taken from the arm of a healthy person, and be cautiously injected into the patient's veins.

Transfusion of Blood.—The best instrument for this operation is a syringe made for the purpose; but if this should not be at hand (as in all probability it will not be on an emergency) any other syringe with an accurately fitting piston, such as the syringe commonly used for the ear, may be made to answer the purpose. An incision, an inch and a half long, should be made over one of the most prominent veins at the bend of the elbow, which must be raised by a probe passed under it. Blood should be drawn in a full stream from the arm of a bystander; and a syringe, having been first rinsed out with clean water at blood heat, should be fully charged with this blood. Its nozzle should then be inserted into an aperture in the patient's vein, and the blood in it be driven gently along towards the heart. "We should slowly and cautiously urge in the blood, watching the countenance of the patient. If the lips quiver, or eyes flicker, we are to cease; if the countenance improves, we are to proceed. If obliged to wait for a minute or two, we must discharge the instrument, and refill it with blood. We are to wait six or eight minutes between each injection; and wash out the syringe with water at blood heat." The greatest care is necessary to prevent the entrance of air, or of coagula.*

SECONDARY HÆMORRHAGE may occur under the following circumstances: 1. It often happens that in a few hours after a wound has been bound up, and the patient put to bed and become warm, sundry small arteries bleed. This case is easily managed. The wound must be opened; any vessels must be tied that require it; the surface be sponged with cold water, and then be exposed to the air for a few hours. 2. There may be a *general oozing* of blood from a wound, owing to some disorder of the general health. Its *causes* and *treat-*

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* Blundell's Lectures on Midwifery, Lancet; Ryan's Midwifery, p. 485.

ment are described in the chapters on Hæmorrhage, and on Gunshot Wounds. The surgeon must recollect its liability to occur in the female from the menstrual nisus. 3. Hæmorrhage may occur from *sloughing* or from *ulceration* of an artery ; or from imperfect closure of an artery when a ligature separates; through the influence of some diseased state of the artery, or of the constitution, which has prevented the healthy process of adhesion ; and this form of hæmorrhage will be more likely to occur, if the ligature was coarse, thick, and ill-applied, so as to bruise the internal coats instead of cutting them evenly; or if the artery was much disturbed in its sheath during the operation. In these cases the only remedy is to cut down upon and tie the bleeding orifice ; or if that cannot be done, or the vessel be too diseased to hold the ligature, carefully graduated pressure and styptics may be tried. A small button of lint, imbued with solution of gallic acid, or of sulphate of copper, may be put on the bleeding point (or the latter may be touched with a black-hot iron first), over that a larger compress, and so on, till firm pressure can be produced. Should all these measures fail, the trunk must be tied above at the nearest point to the wound that is possible. 4. Hæmorrhage is apt to come from the lower orifice of a divided artery, if only the upper one has been tied. In this case the blood *wells* out in a continuous stream, but not with the arterial *saltus ;* and it is not quite so florid as that which comes from the other end. 5. Hæmorrhage is very likely to occur if the operation for *aneurism* is applied to a wound of an artery , that is, if the vessel be tied at a distance above instead of at the wounded parts.* For these two cases the ligature is the remedy.

DIFFUSED AND TRAUMATIC ANEURISM.—When an artery has been lacerated, by a broken bone for instance, without a wound of the skin ; or when an artery has been stabbed, and the wound in the skin has healed, but that in the vessel remains open, so that the blood escapes into the cellular tissue, a *diffused aneurism* is said to be formed. But this term is not at all descriptive of the real state of things, and is very liable to lead the young practitioner into the error, of treating the case as if it were a real aneurism. The symptoms are, a dark-coloured swelling of the limb ; perhaps fluctuating ; perhaps yielding some degree of pulsatory thrill, if the aperture in the artery is large ; and most probably, if a large artery is wounded, there will be coldness, numbness, absence of pulsation, and tendency to gangrene in the parts below. This case must not be treated as if it were an aneurism, by a ligature high up : but the main artery being compressed with the fingers, the swelling must be laid open, the blood removed, and the wounded part of the artery secured by two ligatures, one immediately above, the other just below it.

The *false* or *traumatic* aneurism is said to exist, when the lymph, by which a puncture in an artery has been united, yields to the pressure of the blood, and dilates into a sac. This is to be treated like the last case: by two ligatures, one immediately above, the other below the wounded part, if careful compression fails to effect a cure.

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* Guthrie, op. cit. p. 248.

ANEURISMAL VARIX is produced when an artery is punctured through a vein, (the brachial artery through the median basilic vein at the bend of the elbow for instance) and they adhere together, the communication between them remaining permanent. The consequence is, that blood passes from the artery into the vein at each beat of the pulse, causing it to become enlarged and tortuous, and to present a vibrating thrill at each pulse.

VARICOSE ANEURISM is said to exist when an artery has also been punctured through a vein, and a false aneurism has formed between them, opening into both, and formed of lymph that was effused between them. The difference between *aneurismal varix* and *varicose aneurism* (which is a cause of perplexity to young students) is this: aneurismal *varix* is a swelling of a vein, caused by the admission of arterial blood into it. Varicose *aneurism* is the same thing, but with the addition of a false aneurism, situated between the artery and vein. These two cases need not be interfered with unless they enlarge rapidly, or cause inconvenience. If they do, a ligature must be placed both above and below the wounded part of the artery.

THE HÆMORRHAGIC DIATHESIS is a peculiar constitutional defect, which seems to consist in a want of contractility of the arteries, and of coagulability of the blood; so that the slightest wound bleeds almost uncontrollably, and life may be lost through the most trifling injury or surgical operation. If the existence of this diathesis be ascertained, surgeons would do well to refrain from operations with the knife on the individual possessing it. In a case of congenital phymosis, in a person of this kind, which fell under Mr. Liston's care, he very judiciously employed the ligature instead of the knife. This diathesis often runs in families. Thus the history is recorded of four children who were born of healthy parents; their skins were white and complexions fair; they were very subject to fever with ecchymosis; their blood was very fluid, but coagulated in the usual manner; violent coughing easily produced hæmoptysis or epistaxis, and any slight injury caused ecchymosis of the skin. One died at twenty months from biting his tongue; another at eight years from general mucous hæmorrhage, and a third at twelve from epistaxis. In a case of obstinate bleeding of this kind, pressure and the nitrate of silver locally, and a nutritious diet with iron or the acetate of lead and opium, or gallic acid, or turpentine in very small doses, F. 74, seem to be the most hopeful remedies.* Of course in such cases as these it would be a great absurdity to tie an arterial trunk at a distance, though the mistake has been committed.

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* Vide Brit. and For. Med. Rev., Jan. 1840: and two valuable papers by Dr. Allan of the Haslar Hospital, and Mr. Miller of Edinburgh, in Dr. Cormack's Journal for June and July 1842.

SECTION II.—OF INFLAMMATION OF ARTERIES.*

This is rather an uncommon and obscure disease. There are three forms of it: 1. *Subacute Arteritis* (*Phlegmonous Arteritis*, Guthrie) is a local form of inflammation, not extending any great distance. It produces redness and thickening of the artery, with effusion of lymph into its cavity, and coagulation of the blood within it. The *symptoms* are, tenderness and swelling of the affected artery, with violent pain, numbness, absence of arterial pulsation, and tendency to gangrene, in the parts supplied by it. The author lately treated a case in which, during convalescence from acute dysentery, a small portion of the axillary artery suddenly inflamed and became impervious. The arm and hand were cold and benumbed. The circulation through the affected vessel was restored in about three weeks. Mercury and other antiphlogistic remedies are most likely to be of use.

2. *Acute Arteritis* (*Erysipelatous or diffused Arteritis*) has a tendency to spread, and involve the arterial system generally, and to produce rapid suppuration, and it is almost invariably fatal. It may be idiopathic, or it may be caused by a wound. It is known by very violent fever, and great throbbing of the arteries; succeeded by symptoms of irritative or typhoid fever; with livid vesications on different parts of the body. If the disease originate in a wound, there will probably be gangrene. *Treatment* must be antiphlogistic, without reducing the patient too low.

In a case of severe and rapidly fatal inflammation of the chest, the aorta was found to participate in the inflammation, and there was an effusion of adherent lymph on its inner surface, nearly blocking up the left subclavian artery. This is believed to be not an uncommon cause of embarrassed circulation towards the close of acute inflammation in the chest.

A curious case has been recorded by Mr. Crisp (*Lancet*, 1835-6, vol. i. p. 534) of what seems to be rheumatic arteritis. A girl, aged 22, suffered from violent fever, fainting, profuse perspirations, great pain in the limbs, and tenderness in the course of the arteries. After some days, no pulse could be felt in the axillary from an inch below the clavicle, or in the popliteal. Both feet became gangrenous, especially the left, which was amputated below the knee eight months afterwards; at the time of the operation no pulse could be felt in any of the extremities. Very little blood came from the larger arteries, and that not *per saltum*, but the smaller vessels bled profusely. On examination of the leg, the arteries seemed smaller than natural, but not otherwise diseased. In a somewhat similar case, recorded in the Provincial Medical Journal, 23d April, 1842, sudden obliteration of the left axillary artery, with intense pain and numbness of the arm, and sloughing of the end of one finger, followed the hæmorrhage of abortion in a young lady of 24.*

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* Guthrie, op. cit. Mayo, Pathol. p. 447. Copland, Dict. *Art.* Arteries; and Hodgson on Diseases and Injuries of Arteries, Lond. 1815, p. 5.

The practical point to be derived from our knowledge of this complaint is, that, in any case of *spontaneous gangrene*, we should not be too hasty in treating it as a case of debility, by local and general stimulants, till the condition of the arteries has been well examined.

3. *Chronic Arteritis* may be supposed to be an occasional cause or accompaniment of thickening, softening, ossification, occlusion, and other forms of degeneration of arteries.†

SECTION III.—OF ANEURISM.

Definition.—An aneurism is a sac filled with blood, and communicating with an artery, by the rupture or dilatation of which it has been produced.

Varieties.—In the first place, a distinction must be made between *aneurism*, which consists of a dilatation of an artery, for a *part only* of its circumference; and the *general dilatation*, which consists of a bulbous expansion of all the arterial tunics for the whole of their circumference, and which differs from true aneurism in containing no *laminated coagula*.

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The *true* aneurism consists of a sac formed by one or more of the arterial tunics.§ The *false* and diffused aneurism, so called, which result from wounds of arteries, have been described in the 1st section of this chapter. Besides these kinds, authors speak of a *sacculated* aneurism; that is, one which is formed into pouches by an unequal dilatation of its parietes; and of a *dissecting* aneurism, that is to say, one in which the blood finds its way between the arterial tunics, and may even open into the artery at another part.

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* See also Sir B. Brodie's Lecture on Gangrene, Med. Gaz., vol. xvii. for two cases of dry gangrene from arteritis.

† An abstract of a learned paper by Tiedmann on Arteritis and its consequences may be found in Ranking's Abstract, vol. iii., and Ed. Med. and Surg. Jour., Jan. 1846.

‡ An incipient aneurism of the arch of the aorta; the blood was just making its way through a minute ulcerated opening, into a cavity between the arterial tunics, filled with ætheromatous deposit. The portion of artery represented is slit up, so as to show the cut edges, with the deposit between the coats of the vessel.

§ It may be remarked that some authorities call all aneurisms false which do not consist of all three arterial tunics.

Pathology. — The formation of aneurism is preceded by some disease of the artery. Sometimes the middle or fibrous coat becomes opake, yellow, and as thin as paper; sometimes it degenerates into a fatty substance; and a soft, pultaceous, or, as it is called, ætheromatous matter is deposited upon it; this, according to Mr. Gulliver, displays under the microscope earthy and albuminous particles, oily globules, and crystalline plates and scales; and is principally composed of cholesterine. At the same time the lining membrane often acquires considerable thickness and hardness; in consequence, apparently, of an effort to compensate for the weakness of the middle coat; and Dr. Davy believes that these changes must terminate either in aneurism, or in obliteration of the artery.† Or, lastly, there may be a deposit of a brittle calcareous substance (composed of phosphate of lime) in the substance or on the outer surface of the inner tunic. This earthy matter may be deposited in spots, or scales, or rings, or projecting spicula; and in the arteries of elderly people it is very common. But the earthy degeneration of old age does not appear to be so common a cause of aneurism as the soft ætheromatous deposit.

Aneurism generally commences by a giving way of

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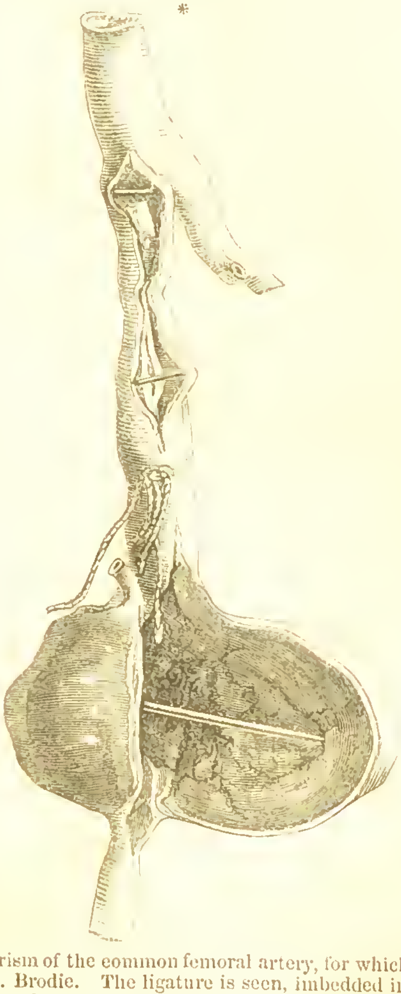

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* This drawing exhibits an aneurism of the common femoral artery, for which the external iliac was tied by Sir B. Brodie. The ligature is seen, imbedded in lymph; the coagulum in the artery above and below it; and the laminated coagula in the aneurism. From the museum of St. George's Hospital.

† Vide Davy's Researches, and Gulliver on Fatty Degeneration of the Arteries, Prov. Med. Jour., March 18th, 1843.

the internal and middle coats of the artery at the site of some æthero-matous spot, after which the pressure of the blood dilates the external or cellular coat into a pouch. This mode of origin is evident from the distinct, rounded, circumscribed opening by which most aneurisms communicate with the artery. But it may also commence by a dilatation of all three of the tunics at some diseased spot. The latter is the opinion of Hodgson. Scarpa, however, asserts "that there is only one form of this disease; that, namely, caused by a rupture of the proper coats of the artery, and an effusion of arterial blood into the cellular sheath which surrounds the ruptured artery."* Sometimes it commences by the blood finding its way into small cysts or abscesses that are developed between the coats of the artery. Sometimes again, as in a case that happened to Mr. Liston, an aneurism commences by an artery ulcerating and opening into a contiguous abscess, the sac of which becomes the sac of the aneurism. Let the aneurism, however, commence as it may, it gradually dilates under the constant pressure of the heart's impulse. It soon becomes lined with coagula, deposited in distinct concentric laminæ, of which the outer ones are the palest and firmest; and whether it was originally formed or not of all the three tunics, certain it is, that the two internal ones soon waste and disappear.

Symptoms.—If an aneurism be seated in the neck or limbs, it appears as a tumour in the course of an artery, and pulsating with it. If it be small, and not filled with coagulum, pressure on the artery above will render it flaccid, so that it may be emptied by pressure; and the blood returns into it afterwards with a peculiar vibratory thrill or *bruissement.* The patient will very often say that it commenced after some violent strain, when something appeared to give way. The first thing usually felt is a pulsation, then a tumour; not painful at first, but gradually becoming excessively so from its pressure as it enlarges.† The neuralgic pain caused by the stretching of nerves, by an increasing aneurism, is often most excruciating. In the chest, aneurism will be principally known by an unnatural pulsation felt by the patient, and detectable by the stethoscope; together with symptoms of disordered circulation and respiration. In the abdomen, an aneurismal tumour may be felt through the parietes.

Diagnosis.—Tumours situated over arteries, and receiving pulsation from them, may be distinguished from aneurism by noticing, 1st, That they do not pulsate at first, when they are small; whereas aneurisms do so from their earliest formation. 2ndly, That a tumour may often be lifted up from the artery, and that then it will cease to pulsate. 3rdly, That aneurisms are generally soft at first, and become hard subsequently; tumours are generally the reverse. 4thly, That tumours *cannot be emptied by pressure;* and that no alteration is made in their consistence by compressing the artery above. 5thly, *Enlarged*

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* Scarpa on Aneurism, by Wishart, Edin. 1808, p. 113.

† C. Hawkins, Med. Gaz. N. S. vol. v. p. 317.

lobes of the thyroid gland may be distinguished from aneurism of the carotid by their slipping up out of the fingers, along with the larynx, in the act of deglutition. 6thly, *Psoas abscess* may be known from aneurism by the precursory pain and weakness in the back ; and by its disappearance when the patient lies down. 7thly, Pulsating tumours, composed of *erectile* or of *malignant growths*—especially those connected with bone—are sometimes mistaken for aneurisms ; from which, in fact, it is hardly possible to distinguish them during life, since they have the same kind of pulsation, attended with the same whizzing noise, and checked like that of aneurism, by pressure on the artery above. The mistake, however, is of no very serious consequence, because the ligature of the main artery, which would cure an aneurism, might check the growth of a tumour.

Progress.—As an aneurism enlarges, its coats become thinner, but are strengthened by the adhesion of the parts around. As the enlargement proceeds, these are gradually absorbed ; bone offers no resistance, but is absorbed as well ; and at last the tumour reaches the skin and distends it. Inflammation succeeds ; the skin becomes red, then livid and vesicated ; and sloughs. When the edge of the slough separates, a fatal bleeding ensues ; sometimes in a gush enough to destroy life at once, although more frequently the blood oozes away slowly. But an aneurism may burst into a mucous canal ;

Fig. 1.*

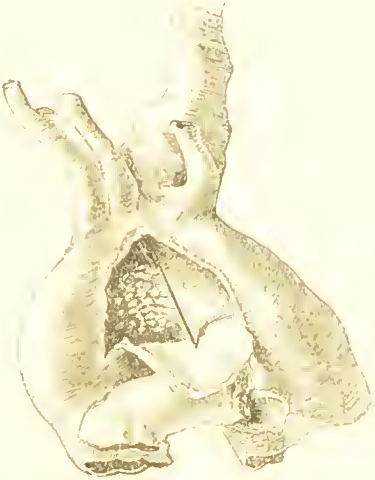
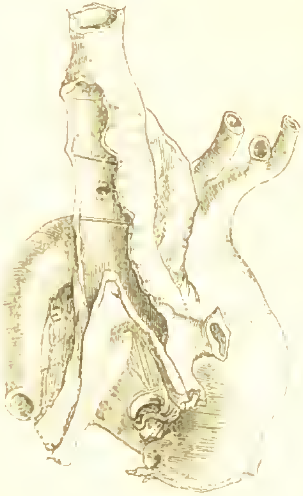


Fig. 2.



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* Figure 1 exhibits a front, and the succeeding one a back view of an aneurism of the arch of the aorta, which burst into the trachea. The opening into the aneurism from the artery, and the ætheromatous patches between the coats of the latter, are well shown. From Mr. Lane's Museum.

or into a serous cavity; or into a vein, with, of course, a fatal disturbance of the circulation if the vein is large; or into the cellular tissue of a limb; or it may cause death through its pressure on the trachea or œsophagus; or through the pain and irritation created by its compressing nerves or interfering with the abdominal viscera, without bursting. We may observe, that when an aneurism opens into a mucous canal (as shown in the preceding figure), it is usually by a small round ulcerated spot, not by a slough, as in the skin; and when it bursts into a serous cavity, it is generally by a crack or fissure.

Spontaneous Cure. — The cure of aneurism depends on the cessation or diminution of the circulation through it; for when this is the case, the blood within it coagulates, forming a solid tumour, which gradually wastes. In some few fortunate cases a spontaneous cure occurs. 1st, If the circulation is languid, the blood in the sac may coagulate of its own accord, and the aneurism be converted into a firm tumour. In some cases, however, the sac does not become quite obliterated, but the coagula become thick and firm enough to resist further distension. Nature generally endeavours to aid this process by enlarging the collateral circulation, and by setting up the adhesive inflammation so as to thicken the artery and obstruct its current. It has happened, in a few lucky cases, that a portion of clot has been detached from the interior of the sac by some accidental violence, and has effected a cure by blocking up the opening into the aneurism. 2ndly, The aneurism has sometimes sloughed, or has been involved in a large abscess; and the artery participating in the inflammation has become obstructed by effusion of lymph, or by coagulation of the blood in it. 3rdly, The artery has become obliterated by an accidental pressure of the aneurism upon it; or by the pressure of blood escaping from it on its bursting into the cellular tissue.

Causes.—The *predisposing* cause of aneurism is some constitutional tendency to arterial disease, which may perhaps be created by intemperance, syphilis, or the abuse of mercury. The *exciting cause* may be, strong emotion of the mind, violent exertion of the body, or local injury. Men are very much more subject to it than women; and it is especially a disease of middle life, being most frequent between the ages of thirty and fifty, although it has occasionally been met with even in children of seven and eight.*

Situation. — The most favourite situation of aneurisms is in the aorta, near the heart; but if aneurisms of the aorta are excluded from our consideration (since they are not to be relieved by any surgical interference), we shall find that of all the arteries of the limbs, the popliteal is the most frequently affected. Thus, out of 179 cases of spontaneous aneurism collected by Lisfranc (not including any of the aorta), there were 59 of the popliteal artery; 26 of the femoral in the groin, and 18 in the femoral at other parts; 17 of the carotid; 16 of the subclavian; 14 of the axillary; 5 of the external iliac; 4 of the innominata; 3 of the brachial, common iliac, and anterior tibial, respectively; 2 of the gluteal, internal iliac, and temporal, respectively; and 1 of the ulnar, perinæal, internal carotid, radial, and palmar arch, respectively.

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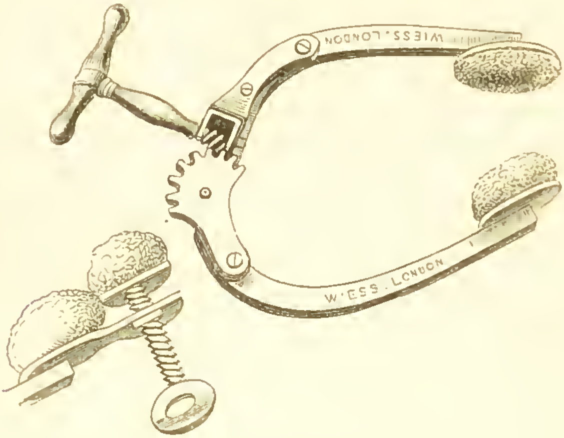
* See cases in Syme's Contributions.

Dissecting Aneurism.— This variety of aneurism begins with ulceration of the lining membrane of an artery at some diseased spot, in such a way that the blood penetrates between the arterial tunics, splitting them up, and making false passages between them. In this way very anomalous symptoms may be produced, of which no better example can be desired than is afforded by a case of Dr. Todd's, related in the 27th volume of the Med. Chir. Transactions. In this case, ulceration had taken place in the aorta, and this was the starting point of a splitting up of the middle arterial tunic, which extended upwards through the innominata into the right carotid and partly into the left, and downwards nearly as low as the kidneys. Of course the getting in of the blood between the coats of the arteries must have materially impeded the circulation through them; and, in fact, in this case caused softening of the anterior portion of the right hemisphere of the brain by depriving it of its supply of blood, besides suppression of urine, and other symptoms that would have been almost inexplicable, unless a post mortem examination had been performed.

Treatment. — The indications are to stop, or at least to check, the circulation through the aneurism, and to produce coagulation of the blood within it. The means are, compression, or ligature of the diseased artery, which means may be aided by internal remedies.

Surgical Treatment.— 1st, *By Compression.* This very simple and obvious mode of arresting the circulation through arteries, was employed long since by Guattani and others, and with some degree of success; but from the imperfect and often violent manner in which it was applied, it more frequently failed than succeeded, and often caused considerable mischief. During the last six years, however, it has been revived by the Dublin surgeons, Hutton, Cusack, and Bellingham, and has been rendered so safe, painless, and speedy a remedy, that it ought to supersede the ligature in popliteal aneurism, and in fact in any case whatever in which it can be applied. It has been proved that it is not necessary *completely* to obstruct the circulation of the artery at the point compressed, still less to excite the adhesive inflammation there so as to obliterate it; in fact, that a very feeble circulation through the aneurismal sac is advantageous. It is found on dissection of cases treated in this manner, that the artery is obliterated at the site of the aneurism.

The instrument employed to cause the pressure, may be either Signoroni's tourniquet (shown in the adjoining sketch)—an arc of steel, with a joint in the middle, and a screw by which the extremities of the instrument are pressed together; or else a solid clamp of steel, having a wooden splint at one end, and a pad with a screw at the other.* By means of either of these instruments it is evident that the pressure is confined to two points only of the circumference of the limb. As soon as it becomes irksome to the patient, it can easily be shifted to a spot higher or lower down in the course of the artery; and it seems advisable to have either two or three instruments, or else two or three pads on the same instrument, so that, as soon as the pressure at one point becomes painful, it is remitted there, and another instrument tightened at a point higher, or lower in the course of the vessel.



The advantages of compression are, that the patient need not be exposed to inflammation, erysipelas, or phlebitis, if proper care be taken; that it can be discontinued in a moment should it appear expedient; and that there is no chance of that severe and frequent accident of the ligature—secondary hæmorrhage.

The objections to it are, that in some cases the patient, from a peculiar irritability of system, or from a great sensitiveness to pain, cannot by any possibility bear it for a sufficient length of time to produce a cure. Several cases have occurred in which the pressure has been of necessity remitted after the patient has borne a great deal of pain, and the operation of tying the artery has been performed. It will also happen, even in cases where the pressure can be endured for a time, that inflammation and sloughing of the integuments will ensue. And this will take place in those cases where there is a

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[*] A modification of the circular torniquet with a spring of vulcanized Indian rubber is described by Dr. Carte, Dub. Med. Press, May 16, 1849. In one case (quoted in Ranking's Abstract, ix. 286) in which pressure by instruments was quite intolerable, the artery was compressed where it passes over the os pubis by the fingers of medical pupils, relieving each other every hour or half hour, and the tumour solidified in forty hours. The case was treated by Dr. Knight, of New Haven, United States.

debility of the capillary system, and a want of vigour in the tegumentary circulation.

Compression is contra-indicated in those cases of aneurism which increase in size with rapidity, for there is always a danger of the tumour bursting, or of the limb below becoming mortified. In such cases the ligature must be applied. And if, *during* the course of treatment by pressure, such circumstances should suddenly arise, it must be at once remitted, and immediate recourse had to ligature of the vessel above.

It may be well to state that the regulation of the instrument employed should not be confided too much to the patient himself, unless he be very intelligent, and perfectly acquainted with the mechanism and precise object of the process; for it has happened that, from anxiety for a speedy cure, and with the idea that the greater the pressure, the sooner this will be effected, the instrument has been screwed up so tightly that serious sloughing of the skin beneath the pads has been produced.

The statistics of this mode of treatment, although limited at present, tend to show that it is less dangerous than the ligature; and much of the prejudice which existed against it has gradually given way, although it is not yet universally employed.*

The pressure, as before said, need never be very severe; nor is it necessary *entirely* to stop the circulation; but if applied with sufficient force to render the current very feeble, the aneurism is, after a time, found to have lost its pulsation, and to have become solid. This happy event may occur in three or six days, or perhaps may require as many weeks; after which the tumour is slowly absorbed, and the limb may be brought into use again.

In cases which do not admit of pressure being applied on the artery leading to the aneurism, it may be tried cautiously on the tumour itself, or upon the artery below it. Cases are recorded which give room for hope from such a measure.†

2ndly, *By Ligature.*—In cases in which the above plan is inapplicable or unavailing, the artery must be tied between the aneurism and the heart. The operation should be performed neither too near the aneurism, so as to place the ligature on a portion of the vessel that is diseased; nor too far from it, lest the circulation through it be kept up by means of collateral branches. After the operation, the temperature of the limb falls two or three degrees; but in a few hours it rises rather higher than that of the opposite limb, because the blood is forced to circulate through the superficial capillaries. Subsequently it sinks again rather below the natural standard. Therefore the patient should be placed in bed, with his limb in an easy position; wrapped up, to preserve its circulation; and though it become rather swelled (which is not unlikely), cold must on no account be applied.

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* For a summary of objections see Mr. Syme's Contributions.

† Vide cases by Dr. O. B. Bellingham, Dublin Journal, May 1845; Messrs. Greatrex and Robinson, M. C. T. vol. xxviii.; and a notice of cases by Liston, Robert Storks, Dartnell, and other surgeons, in Ranking's Abstract, vol. iii.; and a case of axillary aneurism cured by compression on the distal side, by Dr. M. Goldsmith, of America, *ib.*

When a ligature cannot be applied between the aneurism and the heart, it has been proposed to tie the vessel on the distal side; and this operation has been performed with success in cases of carotid aneurism, by Mr. Wardrop and others. But Mr. Guthrie shows that this operation does not act as the ligature between the aneurism and the heart does, by stopping the circulation through the aneurism; but by "giving rise to inflammation in the aneurism, and in the artery both above and below it, and that unless it does this, it fails." It is therefore a dangerous and uncertain operation, and should be performed only where the tumour increases rapidly, and cannot be checked by any other means.

After the operation the limb may become grangrenous, in the same manner as described at p. 126. If the gangrene spread beyond the fingers or toes, amputation should be performed above the level of the ligature.

3rdly, *Medical Treatment.*—In all cases that are submitted to operation, it will be advisable to use various auxiliary measures for reducing the energy of the circulation; and in cases in which no operation can be performed, it is by these only that we can hope to lengthen out the patient's existence. Thus, before using either compression or the ligature, it will be expedient to bleed moderately once or twice, to confine the patient to his bed, and to administer some of the sedative medicines to be presently mentioned.

Bleeding may be performed occasionally, if the patient is plethoric, and the tumour increases rapidly, with violent pulsation; but it should never be carried to faintness. The *diet* should be light. *Bodily* or *mental exertion* and *fermented liquors* should be rigidly abstained from. *Digitalis* and *tartar emetic*, in moderate doses, are sometimes given. But the most useful remedy is the *acetate of lead* given in doses of gr. ½—i ter die, with half that quantity of opium, and a draught containing acetic acid, F. 75. This medicine seems to have the faculty of rendering the blood coagulable, and of diminishing the calibre of the arteries. It used to be mentioned in terms of commendation by Mr. Green in his lectures at King's College, who gave some instances of its efficacy.* But it must be recollected that *frequent bleeding* and too *rigid starvation* will increase the irritability of the heart and arteries, and render the system incapable of forming healthy lymph; and that consequently they will prevent the desired changes in the aneurismal sac. Particular care should be taken not to administer drastic purgatives; because they invariably cause a great excitement and throbbing of the arteries.

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* See also a case of aneurism of aorta caused by acetate of lead in large doses, Arch. Gen. de Med., Sept. 1839.

SECTION IV.—OF ANEURISM BY ANASTOMOSIS AND NÆVUS.

I.—ANEURISM BY ANASTOMOSIS is a pulsating tumour, generally situated in the subcutaneous tissue of the head or neck, or sometimes in the extremities. It is formed of several enlarged and tortuous arteries, whose coats are excessively thin; and which are accompanied with many dilated veins, which feel like a bundle of worms.

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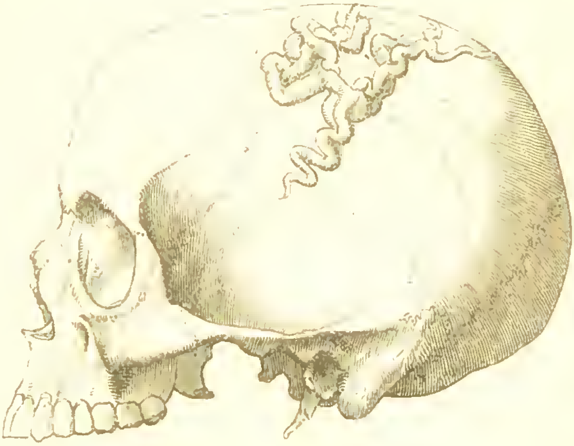

II.—NÆVUS is a similar affection, consisting apparently in an enlargement of very many small vessels, which form a kind of erectile tissue. It may either be seated *in* the skin itself, or *under it* in the cellular tissue; and occasionally is developed in bone. It is doubtful whether it is always a congenital affection, or whether it may be developed in after life.

When *in* the skin it appears soon after birth as a small shining red spot, dusky, or scarlet, according as arterial or venous capillaries predominate in its composition. In many cases it remains stationary, and gives no further trouble; but more commonly it enlarges, and forms a soft pulsatory tumour, the skin covering which is so exceedingly thin, that profuse bleeding may occur from the slightest abrasion.

The symptoms of large nævi, and of aneurism by anastomosis, are the same. " Some of these tumours," says Mr. Liston, " communicate a thrill to the fingers; they can be emptied to a certain extent by uniform and continued pressure, or by interrupting the circulation, and are instantly filled on permitting the blood again to flow into or towards them. The large ones pulsate synchronous with the heart's action. They are much increased in size by anything that increases the activity of the circulation; as the cries of children, and the violent exertion of adults. On the application of the stethoscope, pulsation is heard as in common aneurismal tumours, and a sound which differs from that of the common aneurism, being loud, rough, and whizzing, and which being once heard can never be mistaken."

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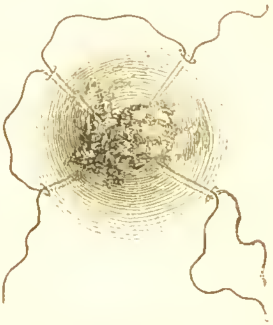
* From a preparation in the King's College Museum, showing an enlarged and tortuous artery.

Their course and termination are also the same. Sometimes they remain for a long time stationary; but in general, gradually enlarge, and distend the skin, and at last ulcerate or slough, and cause the patient's death by repeated hæmorrhage.

Treatment.—The cure of these diseases may be effected either by exciting the adhesive inflammation in the diseased structure, so as to obliterate the distended vessels, or by extirpation with the ligature or knife: the former class of remedies being best adapted for nævi under the skin, the latter for those which implicate the skin itself.

Of the former class, the best remedy is the *seton;* and the best way of using it, is to pass two or three threads, with a common sewing needle, in different directions across the tumour, withdraw them as soon as they have excited suppuration, and then pass others through other parts of the tumour. If a larger needle is used, it should be straight and flat, with sharp edges, and should be made to drag as much silk as it can possibly carry, so as to fill the wound, and prevent hæmorrhage. Some surgeons dip the threads in croton oil or in a solution of lunar caustic, but this seems unnecessary. On a similar principle the nævus may be *punctured* with the point of a lancet, and a fine probe which has been dipped in melted nitrate of silver, or a needle heated to a black heat, may be passed through it in various directions ; or its substance may be simply broken up with a cataract needle. *Pressure* by means of a smooth surface of ivory or sheet-lead, confined by strips of plaster and a bandage, is a good remedy, if the nævus is small, and situated over a bone, so that it can be applied uniformly and effectually. The *injection* of an astringent fluid by means of Anel's syringe, has been proposed, but has caused the death of a child by convulsions. *Vaccination* has also been used for this disease; but it requires that the whole surface of the tumour and some of the skin around should be inoculated, so as to cover it with a confluent vesicle, which excites great fever, and the opportunity of doing so must be rare. A very small nævus may also be destroyed by puncturing it, and inserting into the puncture a glass pen dipped in nitric acid; this is also a good method of removing little red spots on the face, formed by a distended vessel with radiating branches; but immediately after applying the acid, the part should be sponged with a solution of carbonate of soda, to prevent any scar on the skin. Mr. Fergusson sometimes passes a needle under a small nævus, and twists a thread over it, so as to cause considerable pressure, allowing it to remain for forty-eight hours or longer, after the manner used for the relief of varicose veins.

Extirpation of these tumours is practicable only when they are of the cutaneous variety, or when they can be lifted up from the parts beneath, so that their whole extent can be ascertained. If it is done with the knife, two elliptical incisions should be made, to include the whole of the diseased growth, and a little of the sound tissues around. For, to use Mr. Guthrie's words, "it cannot be too forcibly impressed on the mind of the surgeon, that if the diseased part be cut *into*, the bleeding will be terrific and difficult to stop."



But it is generally considered that the ligature is the safest and best method. One mode of using it is to pass two or three needles crucially through the base of the tumour, and then twist a strong silk ligature firmly round beneath them. Or instead of this, two or more double ligatures may be passed through the base of the tumour, with a curved needle which has its eye at its pointed extremity, and then the tumour may be strangulated by tying the adjacent threads together. Mr. Fergusson has devised the knot represented in the adjoining figure. A needle armed with a double thread is thrust transversely under the centre of the tumour. The centre of the thread, which has the needle in it, is then divided. Next, one end of the thread is passed through the eye of a needle, which eye should be near its point, and, having been brought one-fourth round the circumference of the tumour is thrust transversely through its base. Then it is to be disengaged from the eye of the needle, and the other thread to be put into the eye, and to be carried back with it. Lastly, the adjoining ends of the two threads are to be tied tightly; so that each of the two threads shall include an 8-shaped portion of the tumour. The tumour may be punctured before the threads are finally tightened, but in every case the constriction should be made as tight as possible. After two or three days the ligatures should be tightened, or fresh ones should be applied. If the skin is not implicated, it may be dissected back in flaps before the ligatures are passed; or, the process may be expedited, and pain be saved, by just cutting through the cutis vera, and sinking the ligatures in the cuts; so that the painful process of ulceration through the skin may be saved. Mr. C. Hawkins says the granulations after an operation often look large and prominent, as if the disease would return, but heal up readily.*

Another method analogous to extirpation, is the division of all the soft parts around the tumour. This was once done successfully by

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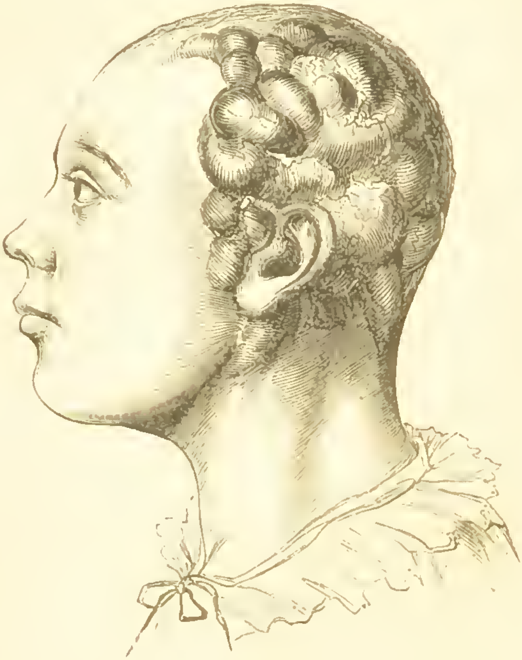
* Med. Gaz. N. S. vol. iv. p. 940.

Mr. Lawrence, in an aneurism by anastomosis on the finger. He divided all the soft parts, except the tendons and thecæ. But in other cases it has been unavailing.

If the disease is inaccessible to any of these means (as in the orbit), and increases rapidly, ligature of the common carotid (or of all the large trunks supplying it) is the only resource; but it is dangerous and not often successful.

The adjacent figure represents a case of this disease, chiefly of a venous character in a female, about thirty years of age. Mr. Storks tied the common carotid artery, with the effect of producing a marked decrease in the tumour; and the patient having been subsequently admitted into the King's College Hospital under the care of Mr. Fergusson, the remaining tumour was successfully treated with the needle and ligature employed as for the cure of varicose veins.*



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* Vide Curling's Pathological Lectures in Med. Gaz., July 1838. Lawrence, Med. Chir. Trans. ix. 216. A fatal case of convulsion during the operation for nævus by injection, Med. Gaz. vol. xxi. p. 529. J. Adair Laurie on Cricoid Aneurism, Med. Gaz. 21st Oct. 1842. The author has also borrowed from a lecture which he heard delivered by Sir B. Brodie at St. George's Hospital, in Nov. 1842, as well as from many clinical remarks of Mr. Fergusson after operations in the King's College Hospital.

CHAPTER VIII.

OF INJURIES AND DISEASES OF VEINS.

I. Wounds.—The hæmorrhage from wounded veins is not in general dangerous, unless from some large and deep-seated trunk, or from a large varicose vein on the leg. It may in ordinary cases be restrained by pressure and a raised position. But if there is any difficulty in the matter, it will be necessary either to apply a ligature, (which, however, should always be avoided if possible,) or to keep up unremitting pressure on the bleeding point with the finger. The latter practice was resorted to "in the case of his Excellency William Prince of Orange, who, in his hurt by the Spanish boy, as my Lord Bacon relates, when the internal jugular was opened, could find no way to stop the flux of blood, till the orifice of the wound was hard compressed by men's thumbs, succeeding for their ease one after the other, for the space of forty-eight hours, when it was hereby stanched." *

II. Inflammation of Veins, or Phlebitis, is a very important disease, of which there are two forms:—

1. The *Subacute*, or *circumscribed*, or *localized*, or that unattended with any general contamination of the blood; and, 2. the *acute*, or *diffused*, or *erysipelatous*, in which there exists the condition called *pyohæmia*, or poisoning of the blood with pus, or some other morbid secretion.

The Subacute Phlebitis is not usually a serious disease, and generally affects the veins of the legs, especially if varicose. The *symptoms* are tenderness and hardness of the affected vein, more or less swelling around it, œdema of the parts below, and painfulness of the limb generally. After it has subsided, the vein is usually felt hard as a cord; because, as was explained in a previous page, inflammation of a blood-vessel causes the blood within to coagulate, which, with the lymph that is effused, renders it impervious. It sometimes, although rarely, causes a circumscribed abscess in the vein, or in the cellular tissue around it.

Yet cases sometimes occur, in which phlebitis begins in this comparatively harmless and local form: with no shivering, and no constitutional disturbance; but with mere œdema and obscure tenderness; but which, after a time, proceed and terminate with all the symptoms of the more dangerous variety. The *phlegmasia dolens* so common after child-birth, is an instance of subacute phlebitis of the large veins of the lower extremity, with perhaps inflammation of the lymphatics likewise.

Treatment.—Rest, with the limb in an elevated position; leeches;

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* Turner, op. cit. vol. i. p. 346.

fomentations, or cold lotions, according to the patient's choice; and purgatives; subsequently, friction with camphorated oil, and other mild liniments, and bandages.

III. ACUTE PHLEBITIS, with a poisoned condition of the blood, is a most dangerous, and generally a fatal disease. It is a frequent concomitant of malignant puerperal fever, phlegmonous erysipelas, and diffused cellular inflammation; with which diseases it appears to be identical in its type, and in the form of constitutional affection which attends it.

Symptoms.—The symptoms are, repeated shiverings, or perhaps fainting fits; rapidity of the pulse, anxiety of the countenance, depression of spirits, catching pains about the heart, and more or less swelling and tenderness over the course of the affected veins; the tongue soon becomes furred, brown and dry, or black; the pulse exceedingly rapid and weak; the prostration of strength and spirits extreme; and the skin and conjunctivæ sallow. The precise order of symptoms and modes of termination are various. In some cases the patient speedily sinks, without any well-developed local symptoms. In others, the leading feature is a most profuse vomiting and purging of fetid yellow bile, which is generally doubtless a salutary effort of nature to relieve the veins of poisonous matter. In other cases, rapid and incurable inflammations of the contents of the head or of the thorax, or abdomen supervene—marked respectively by delirium or coma; by difficulty of breathing, cough, and dulness on percussion of the chest; or by incessant green or black vomit, with great pain and abdominal tenderness. In other cases, great swelling and redness occur over the inflamed veins, and abscesses form, which, if punctured, are found to contain clots of blood mixed with pus. Another most characteristic termination of this disease is the formation of *consecutive* or *secondary abscesses.* The patient remains low, with an anxious sallow countenance, rapid pulse, and yellow tongue; and suddenly complains of excruciating pain in the shoulder, knee, or some other joint, which is rapidly succeeded by a copious formation of pus; and this abscess is followed by others in the other joints, or in the lungs or liver, which ultimately cause death.

Morbid Appearances.—At an early period of the disease, the lining membrane of the affected vein is found deeply red, and a little lymph is effused at the seat of injury. Subsequently, the vein is plugged with coagulated blood and lymph, mixed either with real pus, or with a pus-like fluid formed of softened coagulum. In cases which do not terminate very early, some portion of the vein is formed into an abscess, by the effusion of lymph above and below the inflamed part; and this abscess soon communicates with the cellular tissue by ulceration.

Secondary Abscesses.—There is no tissue or part of the body which may not be the seat of inflammation and abscess, in this disease. When the lungs are affected, the earliest morbid appearance is a small well defined ecchymosed spot, of very dark colour, which soon is surrounded by a hard spherical patch of purple congestion ; though sometimes the colour is brighter, and the diseased spot resembles lobular inflammation. In the centre of this discoloured spot a small portion of light-coloured lymph, or a globule of pus, may be detected, which probably is the *materies morbi*, and has been deposited there from the blood. In the next stage, the diseased patch becomes indurated by effusion of lymph, and afterwards it becomes entirely softened and broken down. In the *liver* similar abscesses may form, and the hepatic veins are sometimes filled with lymph. The *spleen* is often found infiltrated and softened down ; and the kidneys mottled with recently effused lymph. Diffused suppurations are common in the *cellular tissue* and in the *muscles*. The *skin* sometimes presents small deposits of matter resembling small-pox pustules; and sometimes circular patches of it, first become congested, and then slough. The *brain* may be pink and softened, and the *arachnoid* covered with a layer of puriform lymph. The *serous membranes* and the *joints* often inflame violently and suppurate, although, when the pleura is the seat of disease, the morbid fluids found are usually bloody lymph or serum, and not pus. The *blood* too may present visible alterations ; the coagula found in the heart and great vessels, often loose in consistence, and brown in colour, mottled with patches of a dirty yellow.

Pathology.—The extreme fatality of this disease used to be accounted for by supposing that the inflammation travelled along the great veins to the heart. Mr. Arnott, however, showed that this is a mistake, and that the inflammation is generally found to stop abruptly at the juncture of some collateral branch with the inflamed vein. The truth being, that it is not the venous inflammation merely, but the blood-poisoning which accompanies or is caused by that inflammation, which is the real source of danger.

If it were not for a benevolent provision of nature, every wound by which a vein is opened, would be liable to be followed by the intermixture with the blood of the purulent and other secretions formed at the seat of injury. This provision consists in the tendency of healthy blood to coagulate firmly, so as to plug the orifices of divided vessels ; and not only so, but also to coagulate, if any foreign noxious substance be mixed with it. Moreover, as has been very clearly shown by Mr. Henry Lee, nothing causes healthy blood to coagulate more quickly than *pus ;* so that if pus be injected into a vein, or be absorbed in small quantity by the open extremity of a vein, the blood will, under favourable circumstances, coagulate, and so oppose an effectual barrier to the passage of the morbid fluid into the circulation. But, conversely, anything that hinders this salutary coagulation and plugging of the vessels, may be considered a cause of diffused phlebitis.

Causes.—1st. The first set of causes to be enumerated are those that produce a low, enfeebled state of constitution, and render the blood incapable of forming a firm clot, and of yielding healthy lymph for adhesion ; such as profuse loss of blood ; deprivation of food ; anxiety of mind ; organic disease; residence in the contaminated air of an hospital.

2ndly. Local circumstances disturbing the coagulum in a wounded vein, or breaking up the primary adhesion ; such as exercise of an arm after venæsection ; imprudent movements soon after parturition ; local circumstances interfering with the closure of veins, such as the patulous condition of the veins of bone, of the liver, and of the sinuses in the dura-mater. A very large proportion of cases of phlebitis are found to follow injuries and operations on the bones. 3rdly. We must mention the operation of that peculiar poison which, whether generated by putrid miasmata, and floating in the air, or by putrefying coagula in the womb ; or by accumulation of noisome fæces in the colon ; or whether communicated by direct infection, or by inoculation, is capable of generating any one of that closely-allied group of erysipelatous diseases, of which, that under consideration is one of the most formidable.*

Treatment.—In a disease so difficult to remedy, a correct knowledge of its causes may at least be of service in pointing to rational means of prevention. Thus, patients who have undergone a severe injury or operation, and women who have been recently delivered, should not be further debilitated by too low a diet ; and if they have lost much blood, its place should be supplied by good beef-tea in preference to gruel and other slops. The advantage of moderate support by bandages, and of perfect quiescence of body and mind (which may be secured by small repeated doses of opium) must also be obvious.

When the actual symptoms have come on, the two leading indications are 1st. to assist the liver in its task of purifying the blood ; 2ndly. to keep up the strength. For the first purpose, it is well to give one ten-grain dose of calomel, and to follow it by purgatives ; saline purgatives F. 33, 34, 35, 42, if the bowels are torpid—milder ones, as rhubarb and castor-oil, if they are inclined to diarrhœa ; endeavouring to bring away black or yellow fetid stools, not mere water or slime. An emetic may sometimes be of service. For the second purpose, good beef-tea and port wine are of most value ; but it will be very desirable to consult the patient's taste. Some patients crave for bottled beer ; others for soda-water, with or without brandy ; or milk, or lemonade, or nitro-muriatic acid, F. 22, or simple effervescing draughts ; and in almost all cases the dictates of nature may be safely yielded to. Pain and restlessness may be allayed by regular doses of opium, administered in sufficient quantity to produce sleep at night, and to tranquillize the nerves. In other respects, the practitioner must treat symptoms ; local pain and tenderness by a few leeches and fomentations ; congestion in the chest by leeches and blisters, or bran or mustard poultices ; abscesses must be opened at once ; diarrhœa, if exhausting, be moderated by chalk or bismuth mixture ; and in all respects the strength should be husbanded, and the constitution assisted in its struggle with this too fatal disease.

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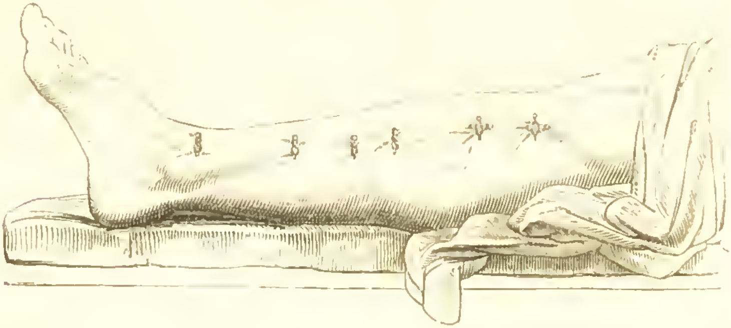
* See a very interesting paper by Mr. Henry Lee, in which he gives the details of twenty-three fatal cases of secondary inflammation, which occurred in St. George's Hospital in 1845. Med. Gaz. vol. xxxviii. ; and a very able paper on Phlebitis, with experiments and copious records of cases, by the same author, in London Journal of Medicine, March and July, 1850.

IV. VARIX signifies an enlarged and tortuous state of the veins, which are generally thickened, rigid, and divided into irregular pouches, with their valves incapable of preventing the reflux of blood. This state may be *caused* by any thing that retards the venous circulation; such as occupations that require a standing posture; or pressure from loaded bowels or the gravid uterus. But there must be an original weakness of structure besides; because varix often occurs when there is no pressure on the veins to account for it; and if produced by temporary pressure in healthy people, always subsides of itself when that pressure is removed; a fact that is familiar to practitioners in midwifery. It is most frequently *seated* in the lower extremities, scrotum, and rectum.

Varicose veins on the leg produce several troublesome consequences. 1. In the first place, they occasion great pain, weight, and fatigue upon taking much exercise, or remaining long in an erect posture. 2. They frequently cause ulcers or excoriation of the skin. 3. Sometimes a vein becomes exceedingly thin, and bursts, causing a profuse or even fatal hæmorrhage, inasmuch as there might be no valves between the part ruptured and the heart. 4. Occasional inflammation occurs, with clotting of the blood in the affected vein; which may perhaps give rise to abscess.

Treatment.—This may either be *palliative* or *radical*. The palliative consists of measures adapted to prevent further enlargement, and induce contraction of the distended veins. If one or two trunks only are affected, it may be sufficient to apply pieces of leather spread with soap plaster firmly over them; but if many smaller veins are enlarged, the whole limb should be well supported with a calico or caoutchouc bandage, or laced stocking, which should be applied in the morning, before the patient rises. Friction with lin. hydrargyri; or with iodine ointment; the application of tincture of iodine, repeated blisters, and electric sparks, have been supposed to accelerate the cure. Friction with a flesh-brush is strongly recommended by Mr. Vincent, but in all cases the friction should be in the course of the blood, not against it; so as not to strain the already weakened valves. Constipation should always be provided against; and when the patient is not taking exercise, the leg should be placed in a raised position.

But if these means fail, and the patient is subject to urgent inconvenience, the radical cure must be resorted to; that is to say, the diseased veins must be obliterated; a proceeding which will have some prospect of success if only one or two large trunks are affected; but not if all the minor cutaneous veins are enlarged also. There are several ways of effecting this. 1st. Some years ago, Sir B. Brodie recommended division of the vein by *subcutaneous section*, in the following way. A long curved narrow-pointed knife, like a bistoury, but cutting on the convex edge, was introduced by the side of the vein, and carried horizontally with its flat surface between it and the skin. Then the convex edge was turned towards the vein, in order to cut through it, as the knife was withdrawn. 2ndly. Mr. Watson, of New York, recommends, in some cases, *excision* of a portion of the affected vein. Then, 3rdly, there is a method which was introduced by Mr. Cartwright, and improved by Mr. Mayo, of destroying a narrow slip of skin across the vein by a paste of *potassa fusa* and quick-lime, in order to cause slight inflammation of the vein, with coagulation of the blood in it, and obliteration of its cavity. 4thly, *Pressure* by means of a firm pad and bandage has been used for the same purpose.



5thly. But the newest and safest treatment is that by means of the twisted suture. The surgeon pinches up the vein between his left fore-finger and thumb, and passes a needle behind it: it is a good plan also to pass another at right angles, which should be made to transfix the vein twice, and should go behind the first; a thread is then to be twisted around them tightly enough to stop the circulation; and this may be done at as many places as the surgeon thinks requisite. The points of the needles should be cut off. They should be allowed to remain till they have begun to create slight ulceration; and it is better, unless the irritation is too great, to permit one or two of them to separate by ulceration quite through the vein; because if they only remain long enough to cause coagulation of the blood between the needles, the coagulum will soon be absorbed again, and the circulation be re-established, as has been conclusively shown by M. Bonnet.

Both before and after any of these operations, care must be taken to avoid every cause of inflammation; because any of them may be followed by abscess or diffused phlebitis, if precaution be neglected.*

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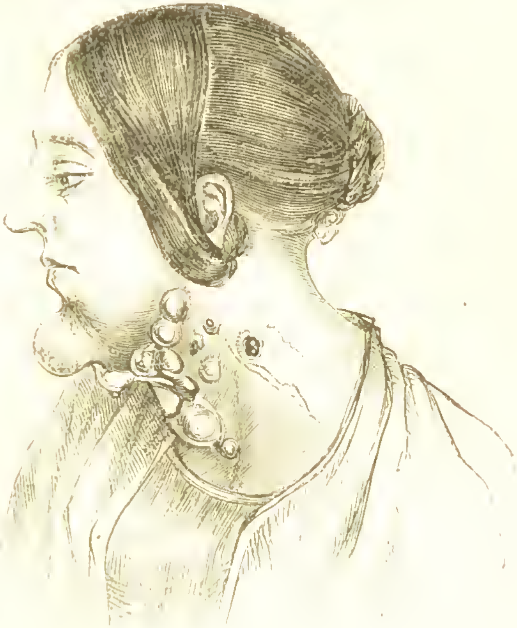
* Vide Arnott in Med. Chir. Trans., vol. xv. Lee, ibid. Mayo, Pathol.; Copland and others in Med. Gaz., July and August 1838. Bonnet, quoted in Brit. and For. Med. Rev., Jan. 1840. Dodd, Med. Gaz., 20th Dec. 1839; and

V. Phlebolites.—Calcareous concretions, formed by the degeneration of coagula, in dilated veins. The adjoining figure represents a patient of Mr. Fergusson's, in whom several of these concretions formed in pouches of irregularly dilated veins under the lower jaw. They were extirpated by the knife, which is the only remedy available.



CHAPTER IX.

OF INJURIES AND DISEASES OF THE NERVES.

I. Complete division of a nerve produces palsy and loss of sensibility in the parts to which it is distributed. The nerve, however, will readily unite in the same manner as bone or tendon, and sensibility and motion will return. Sensibility has been known to return in three weeks, and the power of motion in four weeks after division.

valuable papers by Dr. Norris, and Dr. Watson in American Journ. Med. Sc., Jan. 1843.

A nerve may also recover its functions after a small piece of it has been removed. Sometimes, however, the divided ends, instead of uniting, shrink and become bulbous, as they do in a stump after amputation.*

II. Partial division.—If a nerve is partly divided, leaving some fibres on the stretch, as sometimes happens in venesection, very disagreeable consequences may ensue; such as immediate severe pain, recurring in paroxysms, and shooting in the course of the nerves; violent spasms, or palsy of the limb; fits of epilepsy; and great disorder of the digestive organs. The same symptoms may also ensue if a nerve has been bruised, or compressed, or stretched; or if it has been divided, and its extremity has become implicated and compressed in a cicatrix. This not unfrequently happens after amputation, and produces excruciating pain, with spasm and retraction of the muscles of the stump, causing it to become conical.

Treatment.—If these symptoms come on *immediately* after a wound, so that it is probable that a nerve has been partly divided, an incision may be made so as to divide it completely. If, however, they appeared whilst a wound was healing, it is the best plan to remove the cicatrix entirely. But it unfortunately happens, that neuralgic pains, when once established, do not always cease, even when the cause which produced them at first is removed. Very disagreeable consequences, in the shape of palsy, or numbness, or spasm, are sometimes caused if a nerve is subjected to pressure, as, for instance, the pressure of crutches on the axillary nerves; or from a blow, such as people often meet with on the ulnar nerve above the elbow; or from a violent stretch. Leeches, blisters, and the application of mercurial or tartar emetic ointment, or of opiate or belladonna plasters, or inoculation of a concentrated solution of morphia under the cuticle, are the chief remedies.

III. Inflammation of Nerves is known by pain and tenderness, with fever if acute. *Sciatica* is an example of rheumatic inflammation of the sciatic nerve. Purgatives, alkalis, colchicum, the iodide of potassium, guaiacum, and other anti-rheumatic remedies, must be used according to circumstances.

IV. Neuroma, a tumour formed by the infiltration of a nerve with lymph, and its organization into cartilaginous or fibrous tissue. The bulbs which form on the ends of amputated nerves are instances. The *painful subcutaneous tumour* is another instance.† These tumours, and any others that may exist in or about the trunks of nerves, may produce every conceivable symptom of nervous irritation. Iodine paint, mercurial friction, counter-irritation, and the other means of exciting absorption, may be tried; but if they fail, as they most likely will, the tumour must be extirpated, provided that it be not intimately embedded in the substance of a large nerve, such as the sciatic, the division of which would paralyse a limb.

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* The bulbous ends of a nerve which had not united have been cut out, but without avail. Vide Sir G. Ballingall's Mil. Surg., p. 249.

† Vide p. 200.

V. NEURALGIA, or TIC-DOULOUREUX.—This affection may be *defined* to be severe pain affecting the nerves, not necessarily produced by organic lesion. It occurs in paroxysms of very severe pain, mostly of a plunging, lancinating character, shooting in the course of the nerves. It most frequently attacks persons of middle age, female sex, and comfortable circumstances.

Causes.—The exciting causes may be of two orders. 1. There are some which act upon the nerve that is the seat of pain. Thus neuralgia may be produced by wounds and other injuries, as before related; by tumours; by spicula of bone pressing on the nerve (which is a frequent cause of facial neuralgia); or by some disease in the brain or spinal cord at its origin.

2. It may be caused *sympathetically* by influences that act upon distant parts, or on the system at large; as, for instance, by loss of blood and debility; by wet and cold; by irritation of the skin from eruptions or wounds; by carious teeth; by disorders of the alimentary canal; sometimes by diseases of the urinary or other internal organs; lastly, by *malaria.* When arising from malaria, it is generally *intermittent*, like other diseases arising from the same source, and occurs at regular intervals. But all intermittent neuralgia is not necessarily caused by malaria; because this, as well as other nervous affections, may occur only at stated periods, although caused by a local source of irritation that is permanent.

The *nature* of the complaint is apparently *functional* derangement. The suddenness of its accession and departure, and the absence of organic change in nerves that have been affected for years, prove that it is not essentially inflammatory; although inflammation of a nerve, when existing, may doubtless be an exciting cause.

The most common forms of neuralgia are—the *Supraorbital Neuralgia*, *Brow Ague* or *Hemicrania*, which is usually caused by malaria; neuralgia of the *superior* and *inferior maxillary* nerves, which is often caused by diseased teeth, or disease of the bony canals through which those nerves pass; and neuralgia of the ear, mamma, and testicle, which will be treated of elsewhere; it may also attack the extremities, or any internal organ.

Treatment.—The *indications* are three. *First*, to remove all sources of irritation which may affect the painful nerve, either at its origin or in any part of its course; remembering always that the painful spot is very seldom the real seat of the disease; *secondly*, to amend any disorder of the constitution that can be detected; *thirdly*, to alleviate pain.

In the *first* place, therefore, the whole course of the affected nerve should be thoroughly examined; and if there is a cicatrix, or tumour, or wound, or a carious tooth, or an abscess, or ulcer, or hernia, or aneurism, to which the pain can be attributed, measures should be taken for their removal. In cases of neuralgia of the extremities, if there is any tenderness, or other reason for suspecting inflammation of the nerve or its sheath, leeches and blisters, followed by liniments (especially F. 145, 151), or tartar emetic ointment applied in the course of the nerve, combined with proper constitutional remedies, may effect a cure. The head, and particularly the spine, should be well scrutinized (vide *Spinal Irritation*, chap. xi.). The condition of the great secreting organs, as well as of the stomach, uterus, and rectum, should also be ascertained, in order to make sure that a morbid condition of one of these parts is not the real source of the evil ; and if any pain or tenderness, or other genuine sign of congestion or disease, is detected, it should be removed by cupping, the warm bath and blisters, or the tartar emetic ointment.

Secondly. The state of the constitution must be regulated in the same manner as was directed in the treatment of chronic inflammation. If there are paleness of the lips, emaciation, and debility, iron, bark, and other tonics, may be given with advantage. Inquiry should always be made in these cases for piles, menorrhagia, or other weakening ailments. On the other hand, bleeding and low diet have cured cases attended with hard, full pulse and plethora. In all cases, the appetite, the tongue, the biliary and alvine secretions, and the state of the uterine system, should be investigated. In the brow ague and other cases arising from malaria, quinine should be freely administered; and if it fails, the liq. arsenicalis, or the extract of nux vomica, in doses of gr. ¼ *ter die*, may be tried. In cases of a rheumatic or gouty character, colchicum, F. 70, &c., may be of service. Asafœtida with aloetic purgatives and valerian may be given if there are hysterical symptoms, and sarsaparilla with iodide of potassium, and perhaps with small doses of mercury if the malady has followed syphilis, or if there is any reason to suspect thickening of the bones of the skull. But all lowering remedies, and especially mercury, should be used with the utmost care and hesitation.

Thirdly ; but if no cause whatever can be detected ; or if when detected it cannot be removed ; or if, as frequently happens, even though removed, its removal fail to cure the disease, an *empirical* and *palliative* plan of treatment is the only resource. A course of *purgatives*, especially the croton oil, in doses of ♏ ⅙ *ter die* ; *tonics*, especially the carbonate of iron, and oxide or sulphate, or valerianate of zinc ; any remedies, in fact, that have been known to do good, may be tried in succession ; taking care, however, not to impair the constitution by giving them at random. Opium, morphia, hyoscyamus, belladonna, conium, stramonium, or prussic acid, given internally; friction with ointments, or alcoholic solutions of veratria, strychnia, or aconitina (ʒss ad ℥i)—sprinkling gr. ¼—⅔ of morphia or strychnia, on a newly blistered surface; or making a dozen punctures in the course of the nerve and inoculating a concentrated solution of these alkaloids under the cuticle—galvanism, acupuncture, issues, and the moxa, generally afford some relief, and sometimes completely cure. *Division of the nerve*, with or without *excision* of a portion, is the last and a very bad resource. It may produce instant ease,—this, however, lasts but a short time; and the oftener it is repeated, the more transient are its effects. Sometimes, after repeated divisions, the pain is as severe as ever, although the part may become quite numb and insensible to the touch. The infraorbital and mental nerves (which may be divided from within the mouth just as they escape from their foramina), the frontal, the radial, just after it has passed between the supinator tendon and the bone, and the digital, are those which have been most frequently operated upon.

VI. ANOMALOUS NERVOUS AFFECTIONS.—The same local and constitutional causes that give rise to neuralgia, may also occasion every other symptom that can be produced by functional nervous disorder; such as rigid and permanent spasm (as in wry neck), or twitching and convulsion of muscles; difficulty of swallowing and performing evacuations, owing to spasm of the œsophagus, of the sphincter ani, or of the perineal muscles; sneezing, dumbness, stammering, thirst, and affections of the sight and hearing. The treatment must be conducted on the same principles.

VII. HYSTERICAL NEURALGIA.—Hysterical females are liable to suffer from various obstinate maladies which simulate serious organic diseases. In particular they are exceedingly subject to severe and permanent pain and tenderness of the joints (especially the knee or hip); with weakness of the limb, and inability to use it; or to pain and tenderness of the spine, with perhaps spasms, or weakness of the legs, tympanites of the belly, and palsy of the bladder; symptoms, in fact, of ulcerative disease of the joints or spine, that might mislead careless practitioners; more especially as they are often attributed to some injury. In fact, they present the *sensations* of organic disease, with none of the reality. These cases may be known by observing that the patients are young females (or effeminate males); generally the spoiled children of the rich; or, at all events, persons in whom the *feelings* have been allowed to get the mastery, whilst self-control, abstinence, and firmness of mind and body have never been inculcated. The patients have generally some cause of wretchedness, real or imaginary; perhaps their affections have been blighted; or perhaps when their lover has become their husband, they may have found themselves unable to settle down to the duties and dull realities of life. Most likely (but not invariably) they are subject to irregular menstruation, torpid bowels, and coldness of the extremities; or perhaps to well marked fits of hysterical sobbing and choking. Not uncommonly some intimate friend has laboured under a similar complaint just previously. The pain is greatly aggravated by motion or pressure; but it seems to be principally seated in the skin; and the patient shrinks from the least touch; whilst, if her attention be engaged elsewhere, a somewhat rude examination may be made without complaint. The pain often prevents the patient from sleeping, but once asleep, she may continue so for hours. There may be some degree of swelling, but it is puffy and diffused, and comes and goes capriciously. These complaints may last many years in defiance of all treatment, and then may vanish suddenly without assignable cause ; or perhaps from some strong impression on the nerves ; or perhaps the patient may seek relief in religious fanaticism, or in a runaway marriage. Sometimes the patient labours under an obstinate contraction of some joint; perhaps the hip, or the finger ; which very likely goes off quite suddenly, and transfers itself to another joint.

A more disastrous thing can hardly happen to a patient than to have one of these hysterical affections treated as a genuine disease, by issues, leeches, and confinement to bed ; more especially, if the organ which is the alleged seat of disorder is the uterus, and if the speculum and various local applications are resorted to, to the infinite detriment of the patient's mind and morals. But the surgeon must be equally careful not to make the opposite mistake, and not to treat an ulcerated joint as if it were mere hysteria ; and the author would urge young surgeons to be most careful in their diagnosis, as he knows that mistakes of both these kinds have occurred even to very experienced practitioners.

Treatment.—Any detectable disorder of the digestive or uterine systems should be removed. The patient should have fresh air, generous living, and plenty of occupation for body and mind ; she should be encouraged to take exercise, notwithstanding pain and weakness ; and to resume as far as possible the habits of a healthy person. Friction of the surface ; the shower bath ; the mistura ferri, or the ammonio-chloride in doses of gr. ii. ; the sulphate of zinc in small doses with ext. anthemidis—or the ammonio-sulphate of copper in doses of gr. $\frac{1}{8}$ *ter die*, may be given with benefit if the circulation is languid; and quinine may be of use if the pain is periodic. The bowels should be kept open by nightly doses of the warmer aperients, such as aloes, or colocynth, with asafœtida, cajuput oil, or the compound galbanum pill. Acidity of the stomach must be counteracted by soda or magnesia; and inaction of the liver by occasional doses of the blue pill. Deficiency or excess in menstruation should be properly looked after. "Sometimes," observes Sir B. Brodie, "the symptoms have abated under the use of active purgatives : or of valerian combined with bark and ammonia, or of injections of asafœtida." F. 15 is one of his prescriptions for these cases. He also recommends warm fomentations, especially one composed of sp. rosmarin. ℥iss and mist. camph. ℥viss, or of lin. camph. ℥iv., with ext. belladon. ʒii. Occasional leeching may be of service, but counter-irritants should be avoided. If the limb at any time become very hot, it should be sponged with tepid lotions ; but if cold, it should be wrapped up warmly in flannel and oiled silk. Amputation in these cases is useless and cruel.*

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* Vide Brodie on the Joints, 4th ed. p. 311. Brodie on Local Nervous Affections, Lond. 1837. Rowland on Neuralgia, Lond. 1838.

CHAPTER X.

OF INJURIES OF THE HEAD.

SECTION I.—WOUNDS OF THE SCALP.

Wounds and contusions of the scalp, be they ever so slight, are not to be neglected. For they may be followed by erysipelas ; or by inflammation and suppuration under the occipito-frontalis, or within the cranium, that might easily prove fatal. It may be observed, that sutures are generally inexpedient ; that although there be considerable arterial hæmorrhage, ligatures should be avoided, if it can be restrained by pressure ; that if a flap of the scalp is nearly or even quite detached, it should be carefully washed, and returned to its place, avoiding sutures and pressure by bandages and plasters ; that if a blow on the head causes an extensive and increasing extravasation of blood under the scalp, rendering it evident than an artery has been divided by the blow, the exact situation of the injured vessel should, if possible, be ascertained, and pressure be applied there ; that early and free incision must be made in the event of suppuration, and that punctures must be made if there is great effusion of serum under the occipito-frontalis ; but that if blood is extravasated there, its absorption is to be promoted by bleeding, cold, and low diet; and no incision is to be made, unless positively necessary.

SECTION II.—CONCUSSION OF THE BRAIN.

Definition.—Concussion (commonly called stunning) signifies sudden interruption of the functions of the brain, caused by a blow, or other mechanical injury to the head, and not necessarily attended with visible organic lesion of the brain.

Symptoms.—There are two degrees of it. 1. In ordinary cases, the patient lies for a time motionless, unconscious, and insensible ; if roused and questioned, he answers hastily, and instantly relapses into insensibility; after a time, he moves his limbs as if in uneasy sleep, and vomits, and frequently recovers his senses instantly afterwards; remaining, however, giddy, confused, and sleepy for some hours. 2. In the more severe degree the patient is profoundly insensible, the surface pale and cold, the features ghastly, the pulse feeble, and intermittent, or perhaps insensible, and the breathing slow, or performed only by a feeble sigh, drawn at intervals.

Vomiting is an important symptom. It is not present in very slight cases, nor in very severe ones ; and its occurrence is mostly an indication of approaching recovery.

Consequences.—1. In cases not attended with fracture or lesion of the brain, the patient suffers from some degree of headache and feverishness for a few days, which may easily be aggravated into a fatal inflammation of the brain. 2. If the concussion be very severe, it may be followed by death; although this is not often the case, unless there is also a fracture of the skull, or extravasation of blood within the brain. The degree of danger in any case may be estimated by the degree in which the spinal and ganglionic systems appear to be implicated. If, therefore, the pulse and respiration continue feeble for many hours; if the eyelids do not move when irritated, and the legs are not drawn up when the soles of the feet are tickled, the prognosis will be serious. 3. Concussion is occasionally succeeded by a peculiar state of insensibility, which may last some days. The patient lies as if in a tranquil sleep; his pulse is regular; but on the slightest exertion it rises to 130 or 140, and the carotids beat vehemently; when roused he answers questions, but immediately relapses into unconsciousness. Some patients in this state resemble somnambulists; they may get out of bed, bolt the door, shave, or make water, but still are insensible to what passes around. 4. It may leave a very infirm state of the health and intellect; impairment of the memory, or of the senses, especially of smell and hearing; and a constant tendency to inflammation, and to extravagant actions after drink or any other excitement.

Pathology.—The brain is often found bruised, or ecchymosed, or lacerated; but still concussion may be fatal, without any injury that can be detected by dissection.

Treatment.—The *indications* are: 1. to recover the patient from insensibility and collapse; 2. to prevent inflammation; 3. to restore any faculties that may remain impaired.

1. In order to fulfil the first indication, friction of the surface with the hand, and the application of warmth to the feet, may be resorted to, if the depression is very great, and the pulse very low; but it is better in most cases to leave the patient to recover by himself, than to be officious in administering stimulants, as they would increase the effusion of blood, supposing the brain to be lacerated. Mr. Guthrie's sentiments on this point are very decisive. "It is useless to open the patient's veins," he observes, "for they cannot bleed until he begins to recover, and then the loss of blood would probably kill him. It is as improper to put strong drinks into his mouth, for he cannot swallow; and if he should be so far recovered as to make the attempt, they might probably enter the larynx and destroy him. If he be made to inhale strong stimulating salts, they will probably give rise to inflammation of the inside of his nose and throat to his subsequent great distress." *

2. After reaction has taken place, the bowels should be freely acted on, and perfect rest and low diet should be observed. If the pulse becomes hard and frequent, and if the patient complains of pain or

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* Guthrie, G. J., on Injuries of the Head affecting the Brain. Lond. 1842, p. 11.

tightness in the head, blood should be taken from the arm, or by leeches or cupping from the head,* the purgatives should be repeated as often as may be necessary, with saline and antimonial draughts in the intervals ; and the head should be shaved and kept wet with evaporating lotions. As a general rule, after any severe blow on the head, the patient should observe a cautious antiphlogistic regimen for a month or six weeks—carefully keeping himself free from all fatigue, intemperance, and excitement. If violent delirium or convulsions come on after an injury to the head which has been treated by copious venæsection, and if they are not relieved by further depletion, or if that seems inexpedient, they will probably yield to acetate of morphia.

3. In order to remove headache, deafness, giddiness, squinting, loss of memory, tinnitus aurium, and other remote consequences of concussion, a course of mild alterative mercurials ; repeated blisters, or an issue or seton ; the shower-bath, change of air, general friction of the surface, and a most regular diet, are the remedies.

SECTION III.—COMPRESSION FROM EXTRAVASATED BLOOD.

Symptoms.—The symptoms of compression of the brain are those of apoplexy. They are, insensibility ; general palsy (sometimes, but rarely, confined to one side) ; dilated and insensible pupil ; slow, labouring pulse ; skin often hot and perspiring ; retention of the urine, through palsy of the *detrusor urinæ ;* involuntary discharge of fæces through palsy of the *sphincter ani ;* and stertorous breathing, owing to palsy of the *velum pendulum palati.* Sometimes, however, the pupils are contracted, and sometimes one is contracted and the other dilated.

Causes.—Compression (surgically considered) may be produced by three causes. 1. By extravasation of blood. 2. By fracture of the skull, with depression. 3. By suppuration within its cavity.

The *symptoms of compression from extravasated blood* generally show themselves in the following manner: The patient receives a blow, and becomes stunned and insensible from the concussion, with extremely feeble pulse and cold skin. After a while he recovers his senses; but again in an hour or two he becomes sleepy, confused and insensible ; with slow stertorous breathing, slow pulse, and dilated pupils. The symptoms closely correspond with those of one form of apoplexy called the *ingravescent ;* in which the patient suddenly feels an acute pain in the head, caused by the bursting of a blood-vessel, and becomes sick and faint—in fact, suffers from concussion. Then he recovers his senses—but shortly afterwards, as the extravasation from the ruptured vessel increases, becomes quite comatose.*

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* Whether the patient has recovered his consciousness or not, he should be bled if the pulse become hard, and the skin hot. But bleeding is not a remedy for concussion itself: it merely removes its consequences; and if employed during a depressed state of the circulation, may induce epileptic convulsion, or perhaps death. In every case of sudden insensibility, whether from disease or accident, the vulgar clamorously demand that the patient should be bled; but the surgeon must be very ignorant or very weak if he yields to their wishes.

On the other hand, if a large quantity of blood is extravasated rapidly, the symptoms of compression may immediately succeed the insensibility of concussion, without any interval of consciousness.

The blood may be situated, 1. between the dura-mater and skull; and if in large quantity, it proceeds from laceration of a branch of the middle meningeal artery; 2. between the membranes; 3. in the substance of the brain.

Diagnosis.—The insensibility arising from compression may be distinguished from that which arises from concussion of the brain by observing, 1st. That the symptoms of concussion always follow the accident immediately; those of compression from effusion of blood *may* come on after an interval. "The first stunning or deprivation of sense," says Pott, "may be from either; no man can tell from which; but when these first symptoms have been removed, or have spontaneously disappeared, if such patient is again oppressed with drowsiness or stupidity, it then becomes most probable that the first complaints were from concussion, and that the latter are from extravasation." 2ndly. In concussion, the pulse is feeble, and the skin pale; and the greater the insensibility the feebler will the pulse be. In compression, on the contrary, when reaction is thoroughly established, the pulse will be slow and full, and the skin hot and perspiring. 3rdly. Stertorous breathing and muscular palsy are rare in mere concussion, common in compression. 4thly. The pupil in concussion is variable: sometimes contracted, sometimes dilated, and not always insensible to light; in compression, it is almost always dilated and insensible.

Treatment.—The head should be shaved and examined, and if there is no sign of fracture, the case must be treated as one of apoplexy; the *indications* being to avert inflammation, and procure absorption of the blood by bleeding, cold applications to the head, calomel and purgatives in repeated doses. Frequently a puffy swelling, arises after a day or two, and points out the seat of the blow. If, in spite of the above measures, the insensibility continues, and the lungs become clogged with mucus, and the breath escapes from the corner of the mouth with a peculiar whiff during expiration, which are very perilous symptoms, the last resource—and, under these circumstances, it must be confessed, a very desperate one—is trephining,—which operation should be performed at the seat of the injury, if that is known,—or if that is not known, it should be done where any puffy swelling arises; or lastly, if there is no puffy swelling, it should be done over the middle meningeal artery; and if one side is more palsied than the other, it should be done on the other, because, as is well known, injury of one side of the brain produces palsy of the opposite side of the body. The trephine should be rather large, because the blood is almost always found coagulated. Perhaps the inner table may be found extensively fractured, with only a mere fissure of the outer table. The skull is said always to bleed very little when scraped at the seat of effusion between it and the dura-mater, because it is deprived of its supply of blood from that membrane. This, therefore, is an important diagnostic sign; and in a desperate case it might be advisable to cut through the scalp, and examine the bone at any part where mischief is suspected to exist.

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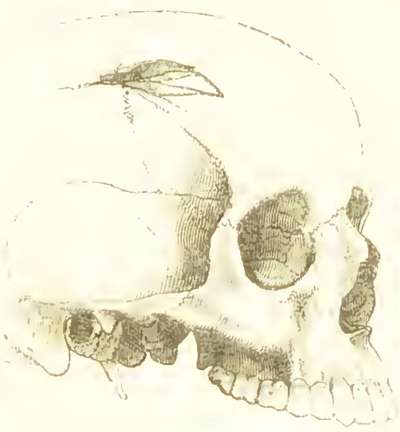
* Copland, Dict. *Art.* Apoplexy.

When a piece of bone has been removed, the dura-mater, in its normal state, is found to be level, and of a reddish silvery colour, and it rises and falls synchronously with the motions of respiration; but if there is fluid underneath, it bulges up tightly into the aperture made by the trephine, and its motions are very indistinct or entirely lost. In this latter case a puncture should be made to let the fluid escape; and numerous instances are on record in which, after the surgeon has punctured the distended dura-mater, and some ounces of blood have escaped, the patient has recovered his consciousness immediately.*

SECTION IV.—FRACTURE OF THE SKULL.

FRACTURES of the skull are divided, 1. into those which consist of a mere crack or fissure without displacement; 2. into fractures with extravasation of blood, which generally accompanies fracture of the anterior inferior angle of the parietal bone, and which was spoken of in the last chapter; and 3. into fractures with depression. *Fracture of the base of the skull* is the most dangerous kind. It is caused when the patient falls from a height, and pitches on his head; the basilar process being snapped through by the weight of the whole body, which tells upon it through the spinal column. In these cases there is frequently a copious venous hæmorrhage from the ears, in consequence of laceration of the sinuses at the base of the brain. This is a most unfavourable symptom; although a slight hæmorrhage from the



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* Guthrie, op. cit. pp. 39, 125. Brodie, Med. Chir. Trans. vol. xiv.

ears, or nose, or mouth, may depend on an insignificant rupture of the membrana tympani, or of the mucous membrane of those parts. These cases mostly terminate fatally, although there is one instance of recovery on record.

A copious discharge of thin watery fluid from the ear, is an indication of imminent peril.* It evidently filters through a crack in the petrous portion, into the tympanum, and thence outwardly through a rupture in the membrana tympani; but whether it comes from the sac of the arachnoid, or from the venous sinuses, is uncertain; most probably from the former, because it is uncoagulable, and, like the cerebro-spinal fluid, contains very little or no albumen or salts. In a case under Mr. Tatum's care in St. George's Hospital, the membrana tympani was ruptured, and the saliva flowed copiously from the ear; of course through the Eustachian tube.

1. *Simple fissure* requires no treatment apart from that of the concussion, compression, or scalp wound, with which it may be accompanied.

2. *Fracture with depression* may be *simple or compound;* the compound being that which is attended with a scalp wound exposing the fracture.

(*a.*) *Simple fracture with depression* may be ascertained by a careful examination of the shaved scalp, when, if it exist, there will be felt a depression at one part, with a corresponding edge or projecting ridge near it. Sometimes a coagulum of blood under the scalp conveys the feeling of a sharp elevated ridge of bone; it may be known, however, by its yielding to firm pressure with the finger, and by observing that no part of the bone is *below* its natural level. But although there may be a real fracture with depression, still there may be no compression of the brain; because the outer table may merely have been driven into the diploe, or the outer wall of the frontal sinus may have been broken in. The former accident (*i. e.* fracture of the outer table only) can only happen to a patient of middle age, because the diploe neither exists in infancy nor in old age; the latter will be known by the escape of air, when the nose is blown forcibly, either into the cellular tissue of the forehead, or out of the wound if there be one.

Treatment.—In a case of *simple* depressed fracture, if there are symptoms of compression of the brain, the scalp should be divided, and the bone be raised by trephining. But if there are no symptoms of compression (and there sometimes are none), and if the patient is conscious and rational, there is a difference of opinion as to the plan to be pursued. Sir A. Cooper and Abernethy direct that no incision should be made through the scalp, nor should the trephine be immediately resorted to, which they contend must necessarily aggravate the amount of the injury, and the patient's danger; but that the patient should be bled, purged, and kept under the strictest antiphlogistic regimen; and then, perhaps, recovery may be completed without the slightest appearance of compression, and inflammation be averted. Even if there be *slight* symptoms of compression, the same plan is to be adopted in the hope that they may be removed by free depletion.

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* For observations on this joint see Guthrie op. cit.; and a notice of papers by MM. Laugein, Robert, and Chassaignac, in Ranking's Abstract, vols. ii. and iii.

The practice, however, of Pott and his predecessors was to trephine in every case of depression; alleging that the operation should be performed in order to prevent ill symptoms, and that if it were delayed till they came on, it would be too late. And this latter doctrine is supported in some degree by Mr. Guthrie, who says, that if fracture with marked depression exists, *in an adult*, it is the best plan to divide the scalp, and ascertain the nature and extent of the depression. If it is probable that portions of bone are sticking into and irritating the dura-mater, it is better to trephine at once, even although no symptoms of compression should be present.*

In children, whose bones are soft and thin, great indentations and depressions may be produced without fracture. They are to be treated antiphlogistically; and if the bowels are kept well open, they may not cause any bad symptom whatever, and the bone may rise in time to its proper level.

(*b.*) In the case of *compound* fracture of the skull, with depression of bone, whether there are symptoms of compression of the brain or not, the bone must be elevated. If possible, it should be done with the elevator; but if one piece of bone is wedged in under another, a *small* aperture should be made with the trephine, in order to make room for employing the elevator. If any pieces of bone are perfectly loose and detached, they must be removed; but not if they have a pretty good adhesion to the pericranium and dura-mater.

SABRE CUTS.—Cuts inflicted by a sword or sabre, if they do not quite penetrate the skull, are to be treated as simple fissures; but if produced by a blow which descended perpendicularly, the inner table of the skull is apt to be extensively splintered; and if on examination with a blunt probe this is found to be the case, recourse should be had to the trephine.

SECTION V.—WOUNDS OF THE BRAIN.

Wounds of the dura-mater add very considerably to the danger of compound fractures of the skull, both from the risk that inflammation may spread over the surface of the arachnoid, and from the greater chance of hernia cerebri. Hence this membrane should never be punctured in search of fluid, without due consideration.

Wounds of the sinuses are of no great consequence, provided the blood does not accumulate within the skull; hæmorrhage from them is easily restrained by pressure.

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* This question is admirably discussed in Sharp's Practical Treatise on Injuries of the Head. Lond. 1841.

Wounds of the brain, whether incised or lacerated, are not of necessity attended with any mental or bodily disorder, besides that which arises from the concussion, compression, or inflammation that may accidentally be present. Instances are numerous in which portions of the brain have been lost, without any ill consequences at the time or afterwards. But yet Sir B. Brodie has observed in some cases a greater degree of mental confusion than usually attends concussion, and in others spasmodic twitchings of the muscles.

If *foreign bodies* are embedded in the brain, the danger will be materially augmented. Sir B. Brodie says, that no foreign body, whether a portion of the skull or not, is to be removed, if the removal will add in the least to the irritation or injury; but the practice of most surgeons is, to remove them without delay, but with as little disturbance as possible.

The *treatment* of these cases consists in the preventing of inflammation; and in causing the wound to cicatrise without the formation of *hernia cerebri.*

SECTION VI.—HERNIA CEREBRI, AND MALIGNANT GROWTHS OF THE CRANIUM AND MENINGES.

HERNIA CEREBRI.—When a portion of the skull has been removed, the brain is liable to protrude through the aperture in the form of a rounded tumour, styled *hernia* or *fungus cerebri.* Mr. Guthrie describes two varieties of it. In the first, which occurs within two days, the tumour is composed of coagulated blood, and is caused by hæmorrhage into the brain, near its surface. It is accompanied with delirium and phrenitis, and is generally fatal. The best treatment is, to shave it off level with the surface, so as to permit a free discharge of blood. The other kind of tumour consists of brain itself, infiltrated with lymph from inflammation; which, if the dura-mater is still entire, causes it to slough by its constant pressure, and then protrudes through the aperture in the skull. As it increases in size, it suffers constriction from the aperture through which it passes, and sloughs; but is speedily succeeded by a fresh growth of brain and of fungous granulation, which undergoes the same processes, till the patient dies of the irritation.

Treatment.—In order to prevent this tumour, a well-regulated pressure, just sufficient to afford a natural support, should be made upon the brain by means of compresses of soft lint oiled, in all cases when the skull is perforated. If the fungus has already protruded, the best application is liq. calcis, with which the lint may be wetted. If this fail, and the degree of pressure requisite to prevent increase cause symptoms of cerebral oppression, the part should be shaved off level with the scalp, and any further growth be prevented by the liq. calcis and lint, and pressure, as before.

MALIGNANT GROWTHS occasionally spring from the dura-mater, and in their earlier stages produce various symptoms, whose intensity is the less in proportion as the increase of the tumour is slow. Sometimes the irritation of the surface of the brain gives rise to epileptic convulsions, which may be accompanied with intense headache limited to the seat of the disease. Sometimes there are the signs of compression, in the form of gradually increasing mental imbecility, and palsy of the limbs. Sometimes the patient is cut off with a sudden attack of hemiplegia. But if he survives long enough, the growth (which is usually of the encephaloid variety) makes its way outwardly, perforates the skull, and appears as a soft lobular tumour. Attentive examination may perhaps detect two kinds of pulsation in it: one synchronous with the arterial pulse, the other with the rise and fall of the brain in respiration. The tumour cannot be moved laterally, but in its earlier stages may perhaps be returned into the skull, giving rise to symptoms of compression. If the patient survives long enough, the disease follows the ordinary course of encephaloid. *Moderate compression* is the only feasible treatment; any interference with the knife can only lead to speedy death.

SECTION VII.—OF INFLAMMATION OF THE BRAIN, ARISING FROM INJURY.

General Description.—Inflammation of the brain rarely makes its appearance till a week after an injury, frequently not till three weeks, or even later. Its symptoms and progress are very various; sometimes sudden, violent, and soon terminating in destructive suppuration; sometimes slow, insidious, and unsuspected, till suddenly manifested by fatal coma or palsy.

Symptoms.—*First stage.*—The patient complains of pain in the head, aggravated by heat, motion, and anything that causes excitement of mind or body, together with a disagreeable sense of languor or weakness, confusion of ideas, quick pulse, disturbed sleep, nausea, and want of appetite, and alternate flushing and paleness. *Second stage.*—The symptoms having lasted a day or two, there comes on a violent rigour, followed by burning heat of the skin; the pulse is hard and frequent; the carotid and temporal arteries pulsate vehemently; the headache becomes most intolerable and throbbing, the pupils are contracted; light is unsupportable to the eyes, and sound to the ears; the tongue is dry, the bowels obstinately costive, and the stomach rejects everything with frequent retching. Besides these symptoms, violent delirium or convulsions come on at intervals, or perhaps coma. If they are unrelieved, the *third stage* soon follows. The pulse loses its force, and becomes either slow and oppressed, or excessively rapid; and squinting, low delirium, convulsions, or palsy, soon usher in death. Rigours, followed by squinting, dilated pupil, stertorous breathing, coma, and palsy, are indications of suppuration

Certain changes on the outside of the head also accompany the mischief that is going on within. Supposing the injury which is the cause of the inflammation to have been accompanied with a wound which up to the occurrence of the inflammation has been going on well,—to use the words of Pott, "the sore loses its florid complexion and granulated surface, and becomes pale, flabby, glassy, and painful; instead of good matter, a thin gleet is discharged from it; the lint with which it is dressed sticks to all parts of it; and the pericranium, instead of adhering firmly to the bone, separates all round from it to some distance from its edges." The bone, moreover, becomes white, dry, and bloodless; because the nutrient vessels that naturally pass from the dura-mater to the skull are cut off, in çonsequence of the inflammation or incipient suppuration of that membrane. If there be no wound, the scalp will present a puffy, circumscribed, indolent tumour at the seat of injury, on incising which the pericranium is found detached. If the dura-mater is exposed, it at first appears of "a dull, sloughy cast, and smeared over with something glutinous," and subsequently is covered with matter.

Pathology.—It is believed that if the membranes and surface of the brain be inflamed, there will be greater pain, and a greater disposition to delirium and convulsion;*—but that in inflammation of the cerebral substance, there will be an early tendency to coma and palsy.

Prognosis will be unfavourable if the malady has advanced to its second stage, and is not promptly relieved by repletion.

Treatment.—Upon the first appearance of the symptoms, bleeding should be performed (perhaps from the temporal artery or jugular vein), to the approach of faintness; the bowels should be most freely opened, and the head be shaved and kept cool and elevated. If they do not yield, leeches should be freely employed, and from two to six grains of calomel, with a quarter of a grain of tartar emetic (not enough to cause vomiting), should be given every two or three hours. The remedies for the third stage are blisters to the head or its vicinity; mustard cataplasms to the feet; terebinthinate or stimulant enemata; and trephining, if suppuration is indicated by symptoms of compression, or by the above-mentioned state of the wound. The trephine should be large, and if the matter be seated between the dura-mater and skull, it may afford relief, although it rarely does.

Abscess in the brain, or that form of disorganisation which is called *softening* or *ramollissement*,† may be very remote consequences of injury, not occurring perhaps for years. Their *symptoms* are very obscure and insidious. Occasional headache; general loss of health and strength; impairment of the memory or other mental faculties; quick pulse, and furred tongue; disorder of the eyes or ears; sense of constriction, or of coldness in the scalp, or of creeping in the limbs, with numbness, are the most frequent. But these are succeeded by sudden convulsions, or palsy, or coma, from which the patient soon dies, although he may perhaps recover for a time.

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* Dr. Marshall Hall ascertained that lacerations of the dura-mater of frogs gave rise to spasmodic motions of the eye, eyelids, and head; probably through the reflex influence of the small branches of the fifth nerve which supply that membrane.

† Softening of the brain may arise from two opposite causes; viz., from *atrophy*, or insufficient supply of arterial blood; or from inflammation; in the latter case, as mentioned at p. 56, the nerve tubes are broken up and mixed with pus and exudation corpuscles.

Treatment.—Blisters, issues, setons, or the tartar emetic ointment; mercurial alteratives; purgatives; occasional depletion; shower-baths; the most regular diet, and avoidance of every kind of excitement of mind or body, are the remedies in case mischief is expected. After the occurrence of palsy, or other decided symptoms, blisters; leeches, if the pulse is strong enough, and there is pain or heat in the head; purgatives, and enemata. But if the patient is low and feeble, he must be supported by mild nutriment and stimulants of the diffusive kind, especially the preparations of ammonia.

SECTION VIII.—TREPHINING AND PARACENTESIS.

I. Trephining.—The apparatus requisite for this operation comprises a large and small trephine, a straight and curved Hey's saw, and an elevator—besides a good scalpel, and the other instruments which every surgeon is supposed to have in his pocket.

There are four cases which may require this operation. 1. Fracture of the skull with depression of bone. 2. Extravasation of blood under the skull. 3. Suppuration of the dura-mater. And lastly, occasional cases of epilepsy arising from the irritation of a diseased spot of the skull. For the first and last cases, the trephine should be quite small, so as not to sacrifice more bone than is absolutely necessary; but when the operation is intended for the relief of suppuration or extravasation, the trephine should be large, so as to afford a free exit to the fluid.

Supposing it to be a case of depressed fracture. In the first place, the bone, if not already laid bare by a scalp wound, must be exposed by an incision in the shape of a V, or T. Then perhaps some loose fragment may be picked out, or a projecting point may be sawn off with a Hey's saw, that will enable the surgeon to raise the depressed portion with the elevator. But if this cannot be done, a circular piece, consisting of the edge of the depressed bone, and of the adjoining bone under which it has been wedged, must be removed. The pericranium being shaved off from the part which is to be perforated, the surgeon applies the trephine, and works it with an alternate pronation and supination of the wrist, and when it has made a circular groove deep enough to work in steadily, he takes care to withdraw the centre pin. He saws on steadily and cautiously, pausing frequently and examining the groove with a probe, to ascertain whether it has reached the dura mater, and when it has, he introduces the elevator to raise the circular piece of bone. He must be particularly careful to fix the centre pin, and the greater part of the circumference of the instrument on firm bone,—and by no means to press heavily, whilst sawing, on any piece that is loose or yielding. The saw will be known to have reached the diploe by the escape of blood with the bone-dust; but it must be recollected that the diploe exists neither in children nor in the aged. The trephine should not be applied in the course of the sutures, nor over the lower part of the frontal or occipital bones, if it can be avoided; but if necessary there is no great objection.

II. Paracentesis Capitis, or puncture of the head, is an operation that sometimes is resorted to in hopeless cases of hydrocephalus in children, when all medicine fails of checking the effusion of water, or of causing it to be absorbed. It has been particularly recommended by Dr. Conquest, who has performed it in nineteen cases, out of which he succeeded in saving ten. The operation consists merely in introducing a very fine trocar or grooved needle perpendicularly to the surface, through the anterior fontanel, as far as possible from the longitudinal sinus. When two or three ounces of fluid have escaped, the puncture should be carefully closed, and moderate support be applied to the head by bandages. If the child becomes faint, it must be kept in the recumbent posture, and have a few drops of sal volatile. The operation may be repeated at intervals of two or three weeks.*

CHAPTER XI.

OF THE DISEASES AND INJURIES OF THE SPINE.

SECTION I.—OF THE DISEASES AND DEFORMITIES.

I. Lateral Curvature.—Curvature of the spine presents many varieties, some of which arise from mere debility, whilst others are caused by the destruction of portions of the spinal column by disease. We shall first describe that distortion which arises from debility of the bones, ligaments, and muscles, and which is exceedingly common in this country in young females from about the age of ten to sixteen.

Symptoms.—The first thing that attracts attention is a projection of one scapula, or of one side of the bosom, or an elevation of one shoulder (most commonly the right), which are popularly, but erroneously supposed to be *growing out.* On examination the spine is found to be curved like an italic *f*. The right shoulder and the right side of the chest are unnaturally high and rounded, whilst the opposite is depressed and concave. In the same way the left hip projects, whilst the loins on the right side are curved inwards.

Causes.—This affection is readily caused by occupations or postures that tax one side of the body more than the other. We shall mention under the head of treatment such as are most common in children, but we may add, that there are some circumstances which almost infallibly cause distortion even in the healthiest adult; such as one leg being shorter than the other, or walking with a wooden leg. Why one-sided postures should cause distortion must be evident, when it is considered that the intervertebral substance is compressible, to such an extent, that an adult man of middle stature loses about an inch of his height after having been in the erect posture during the day, and does not regain it till after some hours of rest. "Since the united thickness of the intervertebral substance in an adult man is about 3·875 inches," we see that they lose nearly one-fourth by compression, which they do not recover till after some hours of rest. But if the weight of the body falls unequally on the spine day after day, it must be evident that they will become compressed on one side more than on the other; and that if their elasticity be impaired, and the muscles and ligaments be weak, and the bones soft, as they are in young persons who have not a sufficiency of fresh air, wholesome food, and active exercise, this lateral distortion will become permanent.*

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* Vide Dr. Watson's Lectures in the Med. Gaz. for March 1841.

Treatment.—Attention must be paid to the following circumstances:—viz. position, exercise, and rest. 1. In the first place, the patient must be watched, in order to find out from what particular attitude or habit the distortion takes its rise. Standing on the right leg is the most frequent, for in this posture the left side of the loins is thrown upwards, and the patient is obliged to raise the right shoulder to keep the body perpendicular. A habit of raising the right shoulder whilst writing, or drawing, or playing the harp, or riding on horseback, or of sleeping constantly on one side with too high a pillow,—the custom of letting girls' dresses be made low on the chest, so that the patient is perpetually inclined to hitch up the shoulder-strap on one side and let it fall off the other, are also occasional causes. And all these, and every other one-sided posture, should be vigilantly prohibited.† 2. The patient should take free exercise in the open air, whether walking or riding, or indulging in any games or sports, such as the dumb-bells, the skipping-rope, drawing a light garden roller, hopping, or carrying weights in the hands. The *club exercise*, introduced by Mr. Angelo into the regular cavalry training, is extremely advantageous.‡ It consists in a series of exercises for the arms, whilst a club or loaded stick about two feet long, and from two to seven pounds in weight, is held in each hand. In this, as well as in using the dumb-bells, or other exercises performed in a standing posture, the patient should stand with the heels close together, the feet at an angle of 60°, the knees straight, the belly thrown back (so that it may not be strained), the chest forwards, and the shoulders square; and whilst both sides are duly exercised, the weaker one should be principally brought into play. Climbing a rope, and swinging by the hands from a cross piece of wood attached to a rope, are also useful. 3. These exercises should never be carried so far as to fatigue; and after using them the patient should lie down on her back on a flat inclined plane, although any easy posture on a bed or sofa, or on the floor, will do as well. She should never be forced to stand longer than is perfectly agreeable, and when sitting should rest herself well against the back of the chair. Her seat should be wide enough to reach to the knees, and the feet should be well supported. These measures, combined with tonics, especially steel, F. 13, good diet, country air, shower-bathing, friction of the back with horsehair gloves, and attention to the health, may be sufficient to cure incipient cases, and to mitigate severer ones.

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* See some judicious observations on this point by Mr. Bishop, in the Lancet for 1846, vol. i. p. 215.

† Jackson, the pugilist, used to say that he knew an infallible plan for making any child crooked; viz., Let it bolt its victuals and stand on one leg. (Vide Mayo's Philosophy of Living.) Whilst on the subject of *bolting* food, the author may hint to his junior readers, that there is generally some *cause* for this habit. Either the appetite is morbidly ravenous, through an unhealthy state of the secretions of the stomach, or else the gums are tender, or the teeth carious, so that mastication gives pain. These states may easily be relieved, and then the bad habit may be attacked with some chance of success.

‡ Vide proposed Regulations for the instruction &c. of the Cavalry. Part I. Published by Authority. Lond. 1832, page 11.

When curvature of the back arises because *one leg is shorter than the other*, of course measures must be taken to put both sides of the pelvis on the same level by adding to the sole of the shoe. But when one leg is wasted, the corresponding side of the nates is also smaller, and the patient sits as it were on two cushions of unequal thickness; and as there is a natural instinct which causes every person to keep both eyes on the same level, the patient is obliged to throw up the shoulder on the wasted side, in order to compensate for the lower level of that side of the pelvis. One mode of remedying this state of things is obvious. Let the patient sit on a seat which is higher by an inch and a half, on the side that the shoulder grows out, than on the opposite. This is a good auxiliary in all cases of lateral curvature. The patient, if a female, may have a little cushion which she can tack on to her petticoats, and put under her, without being noticed, when she sits down.

Curvature from Rickets.—There is another form of curvature from debility, which chiefly affects young children of the lower orders, and arises from *rickets.* It is readily distinguished by the general rickety aspect of the patient (vide p. 215), and by the distortion of the limbs that is also present, as well as by the circumstance that the spine is not simply curved laterally as described above, but is often curved directly forwards; the seat of this curvature being the upper part of the back; or perhaps it may be curved backwards.

There are other measures which must be resorted to for the cure of these and the other severer degrees of spinal distortion, viz. the recumbent position—mechanical support—and mechanical extension.

1. The *recumbent position*, continued for a length of time, is a measure which has been most disgracefully abused by certain spine-quacks;

insomuch that poor wretches who have applied to them to be cured of a mere distortion of the back, have, after many months of confinement, been sent away broken in health, and incapable almost of moving a limb. In slight cases the patient need lie down only for a short time after taking exercise, in order to relieve the spine from the weight of the body whilst its muscles are fatigued. In severe cases the patient should never be permitted to *sit* or *stand* upright; she should, however, walk out daily in the open air; but when *not walking*, should *lie down*. She should, moreover, be provided with some exercises for the arms, which may be used whilst lying down. But a continuance in the recumbent position, without rising at all, is only necessary under one circumstance—and that is, when the curvature increases very fast, and is so abrupt at one point that it begins to compress and irritate the spinal cord, and produce spasms or palsy of the legs.

2. *Mechanical support* is of great service in many cases; and the best way of applying it seems to be by a circular well padded iron girdle, to be buckled round the pelvis, to which is attached a crutch, by which the axilla of the depressed side can be supported and gradually raised, whilst a broad band passes over the convex side of the chest, and forces it back into its proper position.* But all circular constriction of the body, as with the common female stays, is an evil. The author has devised a chair, with supports for the shoulders, so that they can be kept at the same level, and in the same vertical plane; whilst it allows of free motion of the body, backwards and forwards.†

3. *Extension* of the spine longitudinally, may be effected by fixing the pelvis or feet to the bottom of an inclined plain or couch, and the armpits to the upper part of it; then there must be some contrivance by which the couch may be very gently lengthened. Or something may be done by pulling at the arm on the convex side of the chest, whilst one foot of the operator is pressed against that side of the chest, and the other against the pelvis.

II. ANGULAR CURVATURE (*Pott's curvature*) is produced, as the adjoining cut shows, by caries of the bodies of the vertebræ, or ulceration of the intervertebral substance—a disease which generally affects scrofulous children or adults. It usually begins with symptoms that indicate irritation of the spinal cord, such as weakness, coldness, and numbness of the legs, and incapability of taking exertion; and these symptoms are followed by twitchings and spasms of the legs, and afterwards by palsy. The bowels are costive; and there is difficulty sometimes of passing, sometimes of retaining the urine, which is generally pale and alkalescent. Children rarely complain of much pain or tenderness in the back; but if the patient is an adult, there is generally a heavy dull aching pain, aggravated by motion, together with great tenderness on pressure; and a peculiar dead sickening sensation like that of a carious tooth, if a smart blow be struck on the diseased part with the knuckles. Great distress is sometimes caused if the patient seats himself quickly (or bumps down into a chair as the vulgar say) so as to shake the spinal column; and this will sometimes elicit a complaint from children, who give no other sign of pain or tenderness. If the disease is situated in the dorsal vertebræ, it will moreover be accompanied with tightness of the chest, and difficulty of breathing; and if in the cervical, one or both arms may be palsied, and there will be a difficulty of supporting the head, which the patient steadies with his hands whenever he moves about. As the disease advances, the back becomes curved forwards, and the spinous processes of the diseased vertebræ project backwards; so as to cause great deformity; abscesses form, and the patient exhibits great constitutional derangement and hectic.

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* For a good account of such applications, see Lonsdale on Curvature of the Spine.

† It is made by Spratt, of Brook-street, Hanover-square.

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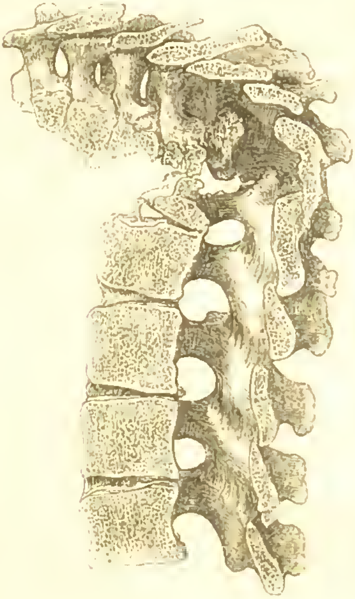

Consequences.—1. In favourable cases, the diseased bones collapse and are anchylosed, as after ulceration of the cartilages of joints; abscesses, if they form, are healed, or their matter is absorbed; and the patient recovers, after many months, with more or less deformity, which is of course incurable. 2. In some fatal cases the patient dies suddenly from two or three of the diseased vertebræ giving way, and crushing the spinal cord; or from dislocation of the odontoid process, owing to ulceration of its ligament; or from the bursting of abscesses into the spinal cord; or from their bursting into the pleura or peritoneum; but more frequently death is caused by slow irritation and exhaustion, consequent on the formation and bursting of psoas or lumbar abscesses.

Diagnosis.—This affection must not be confounded with its hysterical counterfeit spoken of in the ninth chapter. It may readily be distinguished from the distortion which arises from debility by noticing that the curvature is abrupt and angular, whereas in the latter affection it is gradual and rounded, and implicates nearly the whole spine.

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* This cut is sketched from a preparation of Mr. W. Fergusson's, in the King's College Museum.

Treatment.—1. *Rest* in the horizontal posture is absolutely necessary. A water-bed or fracture-bed may be used, if easy or convenient. But the patient must not be taught to lie on his back, nor must any means be used with a view of straightening the spine, as they would merely impede the natural process of recovery, by preventing the remains of the diseased vertebræ from falling together. A bandage containing strips of whalebone, and reaching from the head to the hips, is of use in keeping the trunk at perfect rest. 2. *Issues* should be made and kept open with caustic on each side of the spinous processes of the diseased vertebræ if there is any complaint of pain: or of irritation of the spinal cord. In scrofulous cases they do little good. *Leeches* may relieve occasional accessions of pain or tenderness. 3. At the same time, the constitution must be thoroughly supported by good diet, and by cod-liver oil, lime water, sarsaparilla and steel, and other tonics and alteratives, as directed for scrofula.

III. LUMBAR AND PSOAS ABSCESS.—These are abscesses arising commonly from that diseased condition of the spine which has just been described, although abscesses may occur in the same situation from constitutional debility and other causes, without spinal disease. When the connections of the various muscles and fasciæ to the spine are considered, the variety of courses which these abscesses take, are very intelligible. Sometimes they *point* in the back (constituting *lumbar abscess* if low down); sometimes the matter makes its way between the abdominal muscles, and may *point* at any part of the abdominal parietes; sometimes it enters the sheath of the psoas muscle, passes downwards in its sheath, causes absorption of that muscle, and points below Poupart's ligament, forming a tumour which diminishes or disappears when the patient lies down, and receives an impulse on coughing. This is called *psoas abscess*. In some few cases it does not extend below Poupart's ligament, but can be felt through the abdominal parietes as an oblong tumour in the situation of the psoas muscle: in other cases it extends downwards into the thigh, on either side, or in front, of the femoral vessels. Sometimes it reaches so low as the knee; sometimes passes backwards to the nates; sometimes through the pelvis and sacro-sciatic notch to the nates; and sometimes it has discharged itself through the bladder or rectum.* In all cases of doubtful diagnosis the evidence of disease of the vertebræ, and of rigidity of the psoas muscle, or of inability to hop on the leg of the diseased side, or to extend it fairly on the pelvis should be looked for. The diagnosis is further alluded to in the chapters on Aneurism and Hernia.

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* See Stanley, op. cit. p. 331. Mr. Stanley points out the diagnosis between the *psoas* abscess and the *iliac* abscess; which latter is a collection of matter in the cellular tissue between the peritonæum and the fascia iliaca, or between that fascia and the iliacus muscle. It generally arises from cold, strains, or falls, or from general debility; sometimes from spinal disease, but it is not so regularly connected with the last cause, as psoas abscess is. It generally attacks adults, and often women after parturition. It usually points *above* Poupart's ligament, near the anterior superior spine of the ilium; and the difficulty of extending the thigh, so constant in psoas abscess, is absent.

Treatment.—The first indications are, to procure absorption of the matter, to keep up the health, and to remedy the spinal disease. If the tumour enlarges and threatens to burst in spite of these measures it must be treated in the manner directed for *large chronic abscess*, p. 61.

IV. SPINAL IRRITATION.—The practitioner ought to be aware that portions of the spinal column are liable to fall into a peculiar state of irritation and congestion, and to give rise to various trains of symptoms, which cause immense perplexity and trouble, unless traced to their proper source. Thus, for example, patients may complain (1) of all kinds of *disordered sensation in the skin*, varying between the limits of the most exquisite sensibility, and the most utter numbness and insensibility, and including every variety of creeping, shooting, coldness, formication, tingling, and so forth ; or, 2, they may complain of genuine neuralgic pains, shooting accurately in the course of the nerves, and intermittent or continuous ; or, 3, they may suffer from spasm, or tremor, or cramp, or palsy of any of the voluntary muscles of the limbs ; or, 4, from fixed pain and tenderness, with perhaps some little swelling of a joint, or of the mamma, or testicle ; or, 5, they may suffer from the same kind and amount of irritation and disordered sensation in any internal organ ; such as vertigo, nervous asthma, palpitation of the heart, great flatulence and pain in the stomach or bowels, &c.

Now, as we observed before, when treating of *neuralgia* (p. 325), since the great object is to get at the *source* of these symptoms, the spine should always be examined to ascertain whether it is there ; and more especially since it is very seldom that the patient in these cases makes any complaint of the back. The best method of examination is, to make a firm pressure on each of the spinous processes, or to pass a sponge wrung out of hot water over them ; and then the patient will probably complain of severe pain over one vertebra. Should this be the case, all the symptoms will probably vanish like magic if leeches be applied to the tender spot, and be followed by a blister, or a stimulating liniment, or a plaster containing tartarised antimony.

These symptoms may be present along with lateral curvature of the spine ; but it does not appear that the two affections have any connexion, and one may be relieved without relieving the other. Mere spinal irritation may be distinguished from incipient caries, by attention to the general signs which distinguish functional from organic disease ; in particular by noticing that the patient seldom complains of any pain in the back, and by the length of time the symptoms last without the occurrence of abscess or angular deformity.*

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* Vide Teale's Treatise on Neuralgic diseases, Lond. 1829.

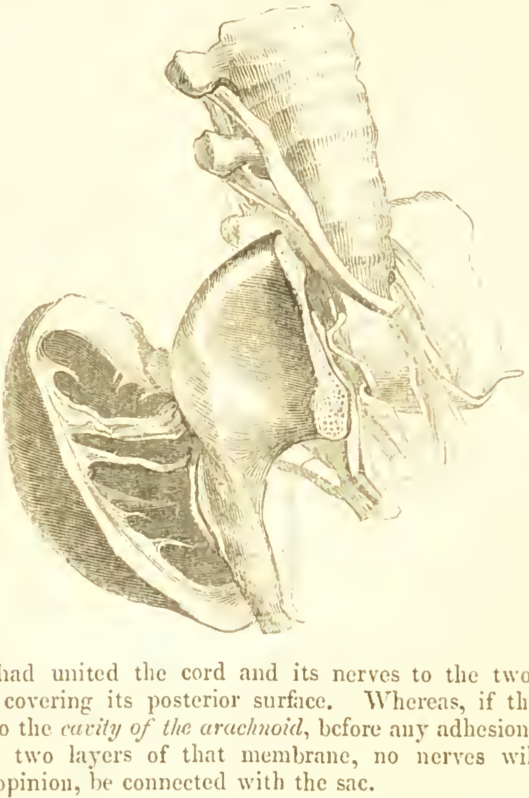
V. Acute or Subacute Inflammation of the spinal cord may be caused by blows, by twists, or other injuries, and may occur during acute rheumatism; moreover it not unfrequently attacks persons who are greatly exposed to cold and wet, such as labourers and prostitutes. Fever, violent pain in the back, and complete paraplegia, with loss of power over the rectum and bladder, are the symptoms. The treatment must consist of bleeding or cupping; calomel to affect the mouth, and subsequently blisters and warm baths. In subacute and chronic cases the iodide of potassium; with colchicum or alkalis if indicated by the state of the urine, and the bichloride of mercury with tincture of bark, F. 87.

VI. Spina Bifida, or *hydrorachitis*, is an affection in which the spinous processes and laminæ of some of the vertebræ are cleft or deficient. The spinal membranes, deprived of their ordinary support, yield to the pressure of the fluid which they contain (which also is secreted in unusual quantity), and bulge out, forming a fluctuating tumour in the middle line of the back.

Pathology.—This affection evidently has its origin in the earliest stage of fœtal existence, and depends on an arrest of development of the laminæ of the vertebræ, and generally of the lumbar and sacral. It is found, on dissection, that not merely the spinal membranes are distended, but that the nerves or the cord itself may have very important connexions with the sac. "If the tumour," to use Mr. Prescott Hewett's words, "corresponds to the two or three upper lumbar vertebræ *only*, the cord itself rarely deviates from its course, and the posterior spinal nerves are generally the only branches which have any connexion with the sac. But if the tumour occupies partly the lumbar and partly the sacral region, then generally *the cord itself* and its nerves will be found intimately connected with the sac. Mr. Cruveilhier believes from his dissections that this connexion is constant."

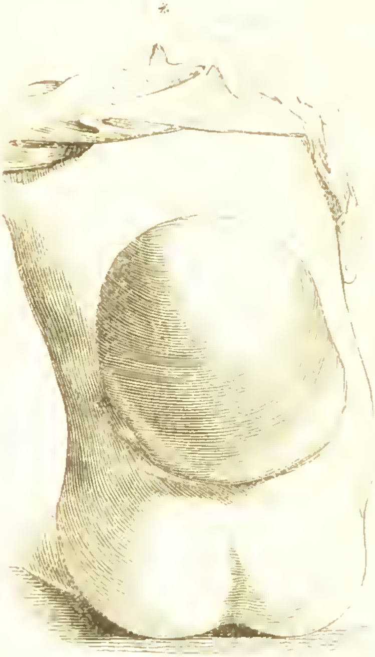
This is well illustrated by the accompanying sketch of a preparation in the St. George's Hospital Museum, made by Mr. Hewett, who kindly obtained permission for the author to have the drawing made. The patient was five months old, and died under Mr. Tatum's care. The cavity of the tumour is seen to be intersected by the cord, and by the nerves emanating from it. The cord and its nerves passing out of the spinal canal at the upper part of the opening run across the cavity of the tumour to its posterior wall, where they are firmly fixed, the nerves being here flattened and spread out upon a fine membrane. From the sac, the anterior branches of the first four sacral nerves return in distinct bundles, forming large loops, to the anterior sacral foramina, through which they pass as usual to form the sacral plexuses. The fluid had evidently been effused between the visceral arachnoid and pia-mater; and the walls of the sac were formed by the visceral and parietal arachnoid and by the skin, all of which were much thickened, and firmly united to each other.

In cases like this, in which the cord and its nerves pass *through the cavity* of the tumour, it is probable that the fluid was originally effused in the *subarachnoid* cellular tissue, after *partial* adhesions had formed between the cord with its nerves, and the two layers of arachnoid covering its posterior surface. But in some cases the cord and its nerves are found spread out upon the posterior wall of the sac, without passing *through* its cavity; and in these most probably the fluid was effused into the subarachnoid cellular tissue, after *extensive* *adhesions* had united the cord and its nerves to the two layers of arachnoid covering its posterior surface. Whereas, if the fluid be effused into the *cavity of the arachnoid*, before any adhesions form between the two layers of that membrane, no nerves will, in Mr. Hewett's opinion, be connected with the sac.



Terminations.—The tumour formed by a spina bifida, may vary in size from that of a turkey's egg, to that of an adult head; and its integuments may be thick and covered with a dense cuticle, or may be thin and transparent. In some cases the tumour bursts during the act of birth; in most others, after the patient has lived some months or years, it becomes enormously distended, and ulcerates, the patient speedily dying of the irritation: in one case, of a young woman, aged 27, which came under the author's observation some time ago, and which has since been under the care of Mr. Walsh, the tumour relieves itself when distended by the exudation of a watery fluid through a minute aperture; and in some few cases the patient lives to the ordinary span of life, without being much troubled with the deformity.

There is further, a great variety in the amount of inconvenience attending it. Sometimes it is combined with congenital hydrocephalus; sometimes with club-foot; sometimes with more or less palsy of the legs, or incontinence of urine (which symptoms are easily accounted for by the wasted and compressed condition in which the cord and its nerves are often found), whilst in other cases there are none of these inconveniences, unless the tumour is compressed or inflamed.



Treatment.—We have been thus minute in describing the real nature of this disease, in order to deter the surgeon from mischievous attempts at curing what must almost inevitably be an incurable malady. We read of cases in which the tumour has been cut off, and the edges united by twisted suture; or, in which it has been included in a ligature and tightly tied; but these plans will not be readily adopted by any one who would rather not open the spinal membranes, or injure the *cauda equina.* The operation of puncture, too, is generally followed by speedily fatal results. Therefore, we think the surgeon's wisest plan is, merely to apply moderate support by means of a hollow truss, or some such contrivance, so as to counteract that tendency to effusion which there always is when the natural pressure on any part of the body is taken away.† If the swelling increase very fast, and the surgeon is inclined to try the effect of a puncture, he should, at all events, strictly observe the following rules laid down by Mr. P. Hewett.

1st. "The tumour should never be punctured along the mesial line, especially in the sacral region; for it is generally at this point that the cord and its nerves are connected with the sac. The puncture is to be made at one side of the sac, and at its lowest part, so as to diminish the risk of wounding any of the nervous branches.

2nd. "The instrument ought to be a needle or a small trocar;

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* Represents the tumour formed in spina bifida. From the King's College collection.

† See a successful case treated by Sir A. Cooper in this way. Med. Chir. Trans. vol. ii.

for if a lancet is used, there will be a greater risk of wounding some important part contained in the cavity of the tumour."*

After puncture very great attention should be paid to proper support by bandages.

VII. Malignant Disease of the Spinal Column. When severe and continued pain in some part of the spine, with more or less derangement of the nervous functions, and perhaps some perceptible tumour, occur in a patient affected with malignant disease, the probability is, that some of the same morbid growth is deposited in or near the vertebræ.†

SECTION II.—INJURIES OF THE SPINE.

I. Concussion.—Violent blows or bendings of the spine are liable to produce very serious injury to the spinal cord. Sometimes they cause an immediate paralysis of the parts below the seat of the injury, which gradually passes off, and thus resembles the effects of concussion of the brain ; sometimes they are followed by inflammation, which requires prompt antiphlogistic measures, in order to avert permanent paraplegia or death.

II. Extravasation of Blood.—A severe blow on the back sometimes causes an extravasation of blood into the spinal canal, which, as it increases, causes compression of the cord, and paraplegia.

III. Dislocation and Fracture.—Dislocation of the spine is rare, except in the cervical region, but it occasionally does occur even in the lumbar and dorsal without any accompanying fracture. When fracture occurs, it generally passes transversely across the body and arch of the vertebræ. The ill consequences of these accidents will of course be proportioned to the amount of injury inflicted on the spinal cord ; and if that escapes compression, the consequences may not be serious. Thus it may happen that one or more spinous processes may be broken off ; or that the cervical vertebræ may be twisted round ; and the last dorsal and first lumbar vertebræ have been displaced backwards, the patient recovering with permanent deformity, but nothing worse.‡

But it more frequently happens in fracture and dislocation of the vertebræ, that the spinal cord is compressed or lacerated, and the parts below the seat of injury deprived of their nervous influence ; and in these cases the symptoms vary, according to the level of the injury.

If the injury affect one of the *lumbar* or *lower dorsal vertebræ*, the legs and lower part of the trunk are palsied and insensible, the penis is erect, the fæces are discharged involuntarily, owing to palsy of the sphincter ani ; but the urine cannot be voided voluntarily, owing to palsy of the muscular coat of the bladder. Immediately after the injury, the secretion of urine is diminished, but in a few days it becomes copious, ammoniacal, and offensive, and the mucous coat of the bladder inflames, and secretes a quantity of viscid adhesive mucus. The bowels are distended with wind, and obstinately costive; in protracted cases the evacuations become black, treacly, and extremely offensive. The temperature of the palsied parts at first rises—in one case so high as 111° F.—but afterwards sinks to the natural level, or below it. In some few cases, in which the spinal cord is not entirely compressed or lacerated, the patient may retain some degree of sensation or motion, or may suffer from painful spasms of the legs; but in general the loss of feeling and motion is complete.

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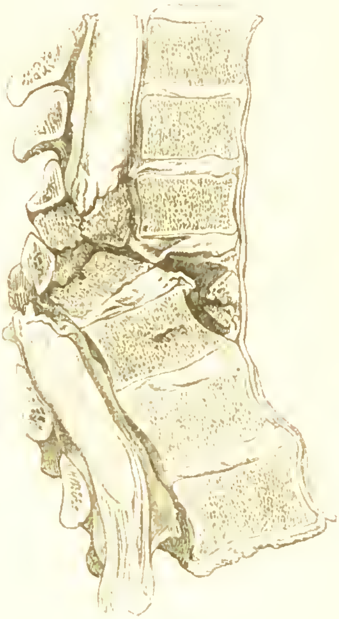
* Vide cases of spina bifida, with remarks by Prescott Hewett. Lond. Med. Gaz. 1844.

† Cæsar Hawkins, Med. Chir. Trans., vol. xxiv.

‡ Guérin, L'Expérience, Dec. 3, 1840 ; Shaw, Med. Gaz. vol. xvii. p. 936.



If the fracture or dislocation be *high in the back*, or at the *lower part of the neck*, there will, in addition to the above symptoms, be palsy of one or both arms, and great difficulty of breathing, especially of *expiration*, because the intercostal and abdominal muscles are palsied, and the diaphragm has no antagonist.

If the injury be *above the origin of the phrenic nerve* (fourth or fifth cervical), the diaphragm will be palsied, and death instantaneous. The most frequent example of this is the dislocation of the odontoid process, which is sometimes caused by ulceration of its transverse ligament, sometimes by blows on the back of the head, or by lifting a child up by the head.

IV. SOFTENING is a frequent consequence of concussion or laceration of the spinal cord. The affected part becomes pulpy and diffluent, without, however, any traces of inflammation.

V. ACUTE INFLAMMATION of the spinal cord is a very rare consequence of injuries, except penetrating wounds, which generally prove speedily fatal in consequence. It is known by rigours, delirium, and opisthotonos, or general convulsions, followed by palsy and coma.

Prognosis.—If a fracture is situated high up, so as to affect the respiration, the patient rarely survives more than a day or two. If it is situated in the lower part of the back, or loins, he may live two or three weeks, or a month; and in some rare cases, recovery has even occurred, of course with permanent paraplegia. The manner in which death occurs after these injuries, is from general exhaustion and debility. The appetite and digestion fail; a weakening diarrhœa comes on, and then the nates slough, and the patient soon sinks. The prognosis is very uncertain after severe blows; sometimes the patient has recovered the use of his limbs even after complete paraplegia; sometimes recovery occurs with permanent paraplegia; sometimes on the other hand, the patient having appeared to recover from the ill effects of the injury, most unexpectedly becomes paralytic, and dies from slow disorganization of the cord.

Treatment.—1. If there be any displacement, an attempt may be made to reduce it by extension. In partial dislocations of the neck, however, the attempt should be very cautious indeed, since although it has succeeded (in the case of M. Guerin for instance), it has also been known to produce instant death. 2. The patient must be kept at perfect rest in the horizontal posture, and the greatest care must be taken to prevent or delay gangrene of the nates, by arranging pillows or Macintosh's air-cushions, half filled with water. 3. The urine must be drawn off by the catheter, and the bowels be kept open by clysters and purgatives, to which Sir B. Brodie recommends ammonia to be added. Tonics and the muriatic acid may be given to support the strength, and obviate the derangement of the urine. The tympanitic state of the belly may be relieved by rubbing it with the compound camphor liniment. 4. Bleeding or cupping may occasionally be employed if there are inflammatory symptoms, and the pulse is firm. But in the majority of cases, if fracture has occurred, and the cord is injured, loss of blood is contra-indicated by the pulse, and would hasten a fatal issue. 5. If the patient recover with his life, any remaining weakness or palsy may perhaps be attempted to be removed by the cautious use of blisters or issues. friction, warm bathing, and the internal use of strychnine; but they will very rarely do any good.*

Written for D. Druitt
by Haynes Walton.

CHAPTER XII.

OF THE INJURIES AND DISEASES OF THE EYE.

SECTION I.—OF WOUNDS AND FOREIGN BODIES.

I. WOUNDS of the eyelids or eyebrows should be most carefully adjusted by means of sutures, introduced with a very fine sewing needle. The greatest care should be taken to prevent irregular cicatrization, with the distortion, entropion, or ectropion, that may be the result of it. A linen rag wetted with cold water should then be laid on the part,—inflammation should be counteracted, and the patient be kept at rest till the wounds are healed. Wounds of the forehead, but more especially of the eyebrow, and of the margin of the orbit, even though the globe of the eye has not been struck, are occasionally followed by amaurosis, owing doubtless to concussion of the retina. The same result is sometimes supposed to follow injuries involving the frontal nerve.

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* Vide Cooper on Dislocations, and Brodie on Injuries of the Spinal Cord, in Med. Chir. Trans., vol. xxi.

II. Blows on the eye are generally followed by a disreputable looking ecchymosis, which is inconvenient enough. But sometimes a blow on the naked eyeball, even when so slight as to leave no trace of injury, causes permanent blindness from concussion of the retina. Antiphlogistic measures are the only resource.

Blood effused into the chambers is generally absorbed in the course of a fortnight, if inflammation be kept down. If coagulated firmly, it will take much longer.

III. Foreign Bodies. When a patient complains of a foreign body in the eye, the surgeon should first examine the inside of the lower eyelid and lower part of the globe, by everting the lid, and telling the patient to look up. If nothing is discovered there, the patient should turn the eye downwards, so as to expose the upper part of the globe, and the surgeon should turn the upper eyelid inside out, which may easily be done by taking the eyelashes between the finger and thumb, and turning the lid upwards over a probe. If any substance stick in the cornea, so that it cannot be removed by a probe, or silver toothpick, or fine forceps, the point of a cataract needle or lancet should be carefully passed under it so as to lift it out. A still more effective instrument is a sort of delicate scoop; for foreign bodies when sharp and angular, and particles of hot iron often become so imbedded in the cornea, that they must be scooped out. Perfect rest to the eyes should be enjoined, and every other means be taken to obviate inflammation. To remove particles of lime or mortar, the lids should be everted and the eye be well syringed or sponged with weak vinegar and water, or with oil, or with pure water if neither be at hand. Mr. Bowman finds a drop of castor oil the most soothing application in these very painful cases in which the epithelium has been scratched or roughly stripped off from the surface of the cornea.*

IV. Prolapse of the Iris, in consequence of penetrating wounds of the cornea, may be attempted to be reduced (provided the pupillary margin is not prolapsed) by closing the eye, and very gently rubbing the lid against the cornea, so as to press on the prolapsed portion, and afterwards by exposing it to a strong light, so as to cause the pupil to contract. Unless the reduction can be attempted immediately after the prolapsus, all chance of returning it is lost, because it soon becomes strangulated. When the case is seen sufficiently early after the accident, and the *pupil has been prolapsed*, belladonna should be applied under the hope of producing dilatation. When the prolapsed part cannot be returned, some surgeons have advised that it be snipped off, lest it irritate the eye ; but in doing so there is *likelihood of producing further protrusion*. The safer plan is to let it remain ; all that is not required to plug up the opening will very soon be removed by a natural process. It is said that touching the wound in the cornea with caustic, when it is slow in healing, facilitates that process.

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* Lectures on the parts concerned in Operations on the Eye, &c. Lond. 1849, p. 129.

SECTION II.—DISEASES OF THE EYELIDS.

I. HORDEOLUM, or sty, is a small painful boil at the edge of the eyelid.

Treatment.—Poultices or fomentations ; subsequently ung. hydr. nitrat. dilut., to remove any remaining hardness. Aperients, and afterwards tonics, and alteratives, are always necessary.

II. OPHTHALMIA TARSI is an inflammation of the edge of the eyelids, with disordered secretion of the Meibomian glands—so that the eyelids stick together and become encrusted with inspissated mucus during sleep. It may be *acute*—attended with great pain and soreness,—but in general it is chronic and obstinate, and attended with itching. It commonly occurs to weakly persons with disordered digestive organs. It may lead to ulceration of the eyelids, loss of the lashes, and subsequent thickening or inversion of the edge of the lids.

Treatment.—In the first place, the health, which is always out of order, must be remedied by aperients, alteratives, tonics, change of air, bathing, and whatever other measures may be suitable for each particular case. Whilst there is much heat and swelling, the eyes should be bathed with an anodyne collyrium, F. 142, and the edges of the lids be smeared with lard at bed time to prevent them from sticking together. But so soon as the bowels have been well cleared, an astringent collyrium F. 140 may be used during the day, and the undiluted unguentum hydrargyri nitratis be applied in very small quantity, with a small camel's hair brush, to the edges of the lids at bed time for three nights successively. A weaker ointment of the same sort may be used for a longer time afterwards if necessary, F. 168. The lashes should be plucked out if there is any ulceration about their roots.

III. SYPHILITIC ULCERS of the eyelids, if primary, will be known by their sudden appearance and rapid progress in a patient otherwise healthy, and by their not having been preceded by a wart or tubercle, like malignant ulcers. Secondary ulcers will be known by their coppery colour and the general cachectic look of the patient, and presence of secondary symptoms in other parts.

Treatment.—The treatment of syphilis generally.

IV. TRICHIASIS signifies a growing inwards of the eyelashes.—

DISTRICHIASIS, a double row of eyelashes, one of which grows inwards. The misplaced hairs must be perpetually plucked out; or if that does not suffice, the entire ciliary edge of the lid, or so much of it as contains the displaced hair, must be smoothly cut off.

V. ENTROPION has been attributed to a variety of causes, among which may be mentioned contraction of the ciliary margin of the lid, thickening of the conjunctiva at the line of reflection from the lid to the globe, contraction of the entire tarsal cartilage, and redundancy of the skin of the lids. Mr. Wilde has endeavoured to show that it is due to contraction of the conjunctiva *lining* the lid. Mr. Haynes Walton attributes its *immediate* cause to the unnatural action of that portion of the orbicularis palpebrarum muscle which covers the edges of the tarsal cartilage, and which he states to be thicker, and more worked than any other portion of the muscle that is on the cartilage.

Mr. Wilde shows that the operations usually undertaken for the removal of entropion, such as the division of the tarsal cartilage perpendicularly at each angle, and suspending the lid after Crampton's method, under the idea of the contraction either of its edge or body; or the removal of any portion of the conjunctiva; or the cutting off the so called redundant skin, do not answer; and recommends the plan of cutting off the cilia, leaving, however, the cartilage entire.

Among the other proofs that Mr. Walton adduces of the power of the ciliary portion of the orbicularis muscle to act in the manner he describes, is the fact that a colleague of his can invert his lids by the influence of the will alone. Mr. Walton proposes, therefore, the removal of the ciliary portion of the muscle so as to destroy the inverting power, and the removal of a portion of the skin of the lid to overcome whatever contraction the tarsus may have acquired. Simple division of the lid by a central slit has been recommended, and is adopted by some surgeons; and Mr. Walton says that this operation, by destroying the perverted action of the orbicularis, may in some instances answer, *i. e.*, where the tarsus has not acquired any permanent curve, but in the great majority it will not, it being necessary in addition to remove a bit of the skin of the lid also.

An incision is made along the edge of the tarsus and close to its cuticular margin, from one angle of the lid to the other; and a second nearly parallel to it, about three lines distant, and joining it at its extremities; the knife being carried down to the cartilage, through both skin and muscle. Then one corner of this flap being raised by forceps, it is dissected clean off the cartilage, and the edges of the wound brought together by sutures.*

VI. ECTROPION, or eversion of the eyelid, may be caused, 1. by a fleshy thickening of the conjunctiva, owing to long-continued inflammation. The weak ung. hydr. nitric. oxyd., or lotion of arg. nit. (gr. ii. ad ℥i) may be tried first in order to bring the conjunctiva into a healthy state—but if they do not succeed, a portion of the thickened conjunctiva must be removed by scissors. This failing, it may be necessary to cut out a triangular slip from the tarsus. 2. It may be caused by a cicatrix on the cheek,—that resulting from a burn for instance. But by far the most common cause is the cicatrization resulting from the healing of abscesses at the edge of the orbit. Various operations have been suggested and practised for its removal, the most successful of which consist of the removal of the cicatrix and the subsequent transplantation of a portion of skin from the temple or the cheek after the manner described in the observation on lost noses. It may also be necessary to remove a wedge-shaped portion of the tarsal cartilage.*

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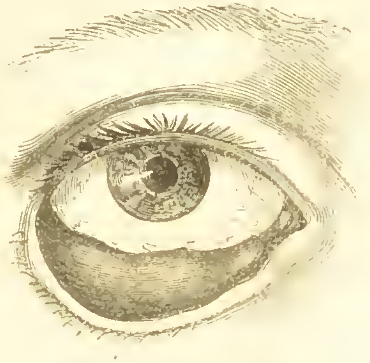
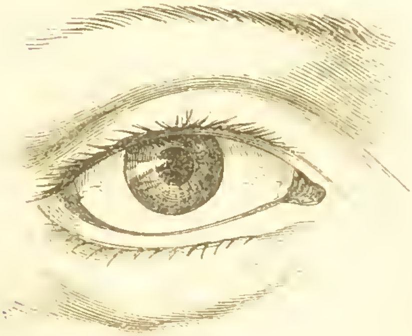
* Vide Wilde on Entropion and Trichiasis, Dub. Jour. Med. Sc., March, 1844. Haynes Walton, Med. Times, 24th May and 10th Aug. 1850.





VII. LAGOPHTHALMOS (hare eye) signifies an inability to close the palpebræ. Sometimes it arises from the contraction of cicatrices, and requires the same treatment as ectropion when arising from the same cause. But it sometimes depends upon inaction of the orbicularis muscle, through palsy of the portio-dura; so that the levator palpebræ being unopposed, keeps the eye open. This may be caused by exposure to cold; on the outside of a coach for instance: in which case it is attended with numbness of the cheek, and generally subsides in a few days with aperients, nursing, and perhaps a blister behind the ear. But it may be caused by a tumour in the course of the nerve; by disease of that part of the temporal bone through which it passes;—or by congestion within the head, like the following disease.

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* The uppermost of the accompanying cuts represents an ectropion caused by a cicatrix; and the other shows the successful results of the operation spoken of in the text. The author begs to thank Mr. Dalrymple, who was the operator in this case, for his kindness in allowing Dr. Westmacott to copy the drawings from his collection.

VIII. PTOSIS signifies a falling of the upper eyelid from palsy of the third nerve. Sometimes it is a precursor of apoplexy, and is attended with headache, giddiness, and other signs of congestion in the head, which should be treated by bleeding, purgatives, mercury, and blisters. Sometimes it is an accompaniment of that form of amaurosis which arises from organic cerebral disease; and is attended with dimness of sight; a sluggish dilated pupil; and more or less strabismus: the eye being turned outwards and downwards because the external rectus and superior oblique are the only muscles unparalyzed. If it occurs without any assignable cause, and persists notwithstanding the employment of every measure calculated to improve the health, a portion of skin must be snipped out from the eyebrow, so that the lid may be brought into contact with the occipito-frontalis muscle, and be elevated by it.

IX. ANCYLOBLEPHARON.—Union of the edges of the lids, when complete and congenital (which is very rare), may be removed by an incision; when partial and consisting of a junction of the lids near one angle, which is sometimes caused by cicatrizing ulcers, it is incurable.

X. SYMBLEPHARON signifies an union of the lid to the globe, following some accident that has caused ulceration of both—the introduction of lime, for instance. It is irremediable, if the adhering surfaces are extensive. Very slight adhesions (fræna) may be divided; but the raw surfaces are too apt to adhere again.

XI. TUMOURS, consisting of *nævi* or *wens*, when occurring on the eyelids, are to be treated the same as elsewhere. Sometimes thin cysts, or hydatids, containing a watery fluid, grow beneath the loose fold of conjunctiva which passes from the inside of the eyelid to the surface of the eyeball. If that fold be divided longitudinally, they may be extracted by a hook or forceps. A small encysted tumour, containing a gelatinous fluid, sometimes grows within the substance of the tarsal cartilage near the margin, about its centre. It feels at first like a small pin's head under the skin ; and on everting the lid it may be seen to cause a slight prominence. It should be punctured from within when it has acquired some little size, and when it begins to look bluish about its centre; and the cyst should be lacerated with the pointed end of a probe.

XII. PEDICULI.—These loathsome insects sometimes lodge about the roots of the eyelashes, and produce an obstinate itching. They are easily killed by any mercurial preparation; but the surgeon ought to be aware of their existence, as they might be mistaken for crusts of dried mucus.

SECTION III.—DISEASES OF THE LACHRYMAL APPARATUS.

I. THE LACHRYMAL GLAND is very rarely the seat of disease. It is, nevertheless, occasionally subject to acute and chronic inflammation—the symptoms and treatment of which will be obvious. It is also liable to morbid growths, for which it has occasionally been extirpated.

II. XEROPHTHALMIA signifies a dryness of the eye from deficiency of the tears, or rather of the mucous secretion of the conjunctiva. It may be palliated by the occasional application of a tepid mucilaginous lotion by means of an eye-cup.

III. EPIPHORA signifies a redundancy or over secretion of tears, so that they run over the cheeks. It should be distinguished from the *stillicidium lachrymarum*, or overflow of tears, in consequence of an obstruction in the channels that convey them to the nose. It may depend on general irritability of the eye, and is not unfrequent in scrofulous children. When arising from this cause it should be treated by aperients and alteratives, with tonics and antacids (F. 20, or quinine, with small doses of sodæ carb.). An emetic may be given if the stomach is foul. The same local applications may be used as are prescribed for scrofulous ophthalmia. Search should be made for foreign bodies or inverted eyelashes.

IV. CLOSURE OF THE PUNCTA LACHRYMALIA may be congenital, in which case it is quite incurable, or it may be a consequence of inflammation of the lachrymal sac and its appendages. Of course it produces a *stillicidium lachrymarum*. When a consequence of inflammation, it is only temporary, and passes off so soon as the inflammation subsides, to which the treatment should be directed. Actual closure of both puncta, except from the cicatrization of a wound, scarcely ever takes place, and the loss of one only, does not matter much. The treatment to be adopted when both are obliterated, is to make an opening between the sac, and the inner corner of the eye, and create a fistulous aperture by the presence of a foreign body. To ascertain whether there is actual stoppage in the passage, Anel's gold probes may be used.

V. OBSTRUCTION OF THE NASAL DUCT is most probably a consequence of thickening of the mucous membrane that lines it, and is not uncommon in delicate young persons. The patient complains of *weakness* of one eye, which is perpetually watering; and of dryness of the corresponding nostril. The lachrymal sac distended with tears forms a small tumour by the side of the nose, from which tears can be squeezed upwards through the puncta, or downwards into the nose, if the obstruction be not quite complete. A case is related of complete obliteration of the bony canal of the nasal duct by bony deposit, in which a permanent opening was established from the eye to the nose.* This affection mostly leads to

VI. CHRONIC INFLAMMATION OF THE LACHRYMAL SAC—tenderness of the sac, perhaps redness of the superjacent skin; irritability and constant tendency to inflammation of the conjunctiva; and if the sac be squeezed, glairy mucus escapes with the tears. There is often great variation in the symptoms in the same case; for there may be great suffering at one time, and scarcely any inconvenience at another.

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* H. Walton, Med. Times, May 1846. A case is related in Forbes's Rev. xii. 641, of congenital absence of the nasal duct, in which M. Berard succeeded in establishing a communication with the nose.

VII. ACUTE INFLAMMATION of the sac is known by great redness, swelling, pain, and tenderness at the side of the nose, implicating the eye, and attended with fever and headache. If it be not soon relieved, the sac will suppurate and burst.

VIII. FISTULA LACHRYMALIS signifies an ugly fistulous aperture at the inner corner of the eye, communicating with the lachrymal sac. It is the ordinary consequence of the three preceding affections if unrelieved, and may be said to have five stages. First, it begins with *obstruction of the nasal duct;* the most prominent symptom of which is a perpetual watering of the eye. Secondly, this is followed by *inflammation;* which, thirdly, gives rise to *abscess;* and this, fourthly, by its bursting causes the *fistulous aperture* from which the name of the affection is derived; whilst, fifthly, in old neglected cases, the lachrymal or inferior turbinated *bone may become carious;* but this is not very common. The fistulous aperture is generally crowded with fungous granulations, and the skin around is red and thickened from the perpetual irritation of the tears that escape from it. Sometimes there is considerable loss of skin.

Treatment.—Acute inflammation of the sac must be treated by leeches, purgatives, and cold lotions or poultices. If the pain increase in severity, and become throbbing, the sac should be opened in the manner to be presently described.

Chronic inflammation of the sac should be treated by an occasional leech to the inside of the nostril; by steaming the nose so as to soothe and bring the whole track of mucous membrane into a healthier state,* and by the strictest attention to the general health, and especially to the functions of the skin and of the digestive organs. When the sac becomes distended, the patient should endeavour to press its contents down into the nose; and he should also frequently draw in his breath strongly whilst his mouth and nostrils are closed, so as to draw the tears down the duct by the pressure of the atmosphere. The secretions of the eyelids should be corrected with citrine ointment (F. 168), and a few drops of some astringent collyrium (F. 140) should be put twice a day into the inner angle of the eye, so that it may be absorbed by the puncta, and carried into the sac. By these means the thickening of the duct may perhaps be removed, or at all events the patient may go on pretty comfortably.

Treatment by the style.—But if the retention of the tears in the sac causes a constant irritability of the eye, or if there is a fistulous orifice between the sac and the cheek, measures should be adopted to restore the obstructed duct. If there is no aperture, the sac should be opened by a narrow knife; introducing it just below the *tendo oculi*, and carrying it downwards and outwards for one-fifth of an inch.

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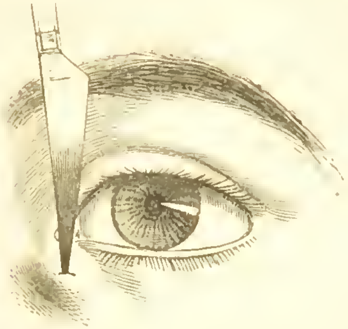
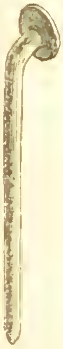
* Vincent, op. cit. p. 212.

The place of the tendo oculi may easily be found by gently drawing the eyelids outwards, when it is seen as a small rounded cord, passing inwards from the inner canthus of the eye. But this guide is scarcely available when there is swelling and inflammation at the corner of the eye; then the operator must trust to his knowledge of anatomy, and to his surgical tact. The escape of tears and mucus shows when the sac is opened. Then a common probe should be pushed through the duct into the nose. In order to make sure of getting it into the sac, it may as well be introduced by the side of the bistoury before that is withdrawn. It should be pushed downwards, but a little backwards and inwards. When in the right direction, its upper part lies in the situation of the supra-orbital notch. It will be known to have reached the nose by the escape of a little blood. When inflammation has subsided a *style* should be introduced, *i.e.*, a silver-gilt probe about an inch or an inch and a quarter long, with a head like a nail, which lies on the cheek, where it passes unnoticed like a black patch.* The constant presence of this instrument causes the duct to dilate, so that the tears flow by its side. It should be occasionally cleaned, and then be replaced; and it causes so much comfort, and the duct is so likely to close if it be left off, that it generally is worn for life. The above is the plan of treatment which the author has generally seen adopted: and the results have been on the whole satisfactory; but it follows of necessity that in so common a complaint many other plans of treatment are followed by different surgeons. Short pieces of catgut bougie, or silver tubes, are sometimes employed instead of the style. Sometimes attempts are made to restore the nasal duct to its proper calibre, by introducing instruments from below; either a common silver probe, with its blunt end bent at a right angle, or else a steel probe made for the purpose; whichever is employed, should be passed along the inferior meatus of the nostril till its point is under the anterior extremity of the inferior turbinated bone, and then by a little manipulation it will pass into the duct.





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* Mr. Walton covers the head of the style with a drop of black sealing wax, melted on smoothly; this is better than black paint, though it will require renewal occasionally. Mr. Walton finds that a style a little bent at the upper end (as in the cut) sits better, and irritates less; when the head of it is merely bevelled off, the lower part of its circumference still rests on the skin and ulcerates it.

SECTION IV.—OF INFLAMMATION OF THE EYE GENERALLY, AND OF THE DISEASES OF THE CONJUNCTIVA.

I. COMMON ACUTE OPHTHALMIA consists of inflammation of the conjunctiva. *Symptoms.*— Smarting, heat, stiffness, and dryness of the eye, with a feeling as if dust had got into it; the conjunctiva of a bright scarlet redness; the redness superficial, so that the enlarged vessels can be moved by pulling the eye-lids; slight intolerance of light and flow of tears on exposure of the eye, and more or less headache and fever. *Causes.*—Slight local irritation, disorder of the digestive organs, or cold and damp.

Catarrhal Ophthalmia is a variety of this inflammation, caused by cold and damp, and attended with a thin mucous discharge, which in severe cases becomes thick, purulent, and doubtless contagious.

Treatment.—A dose of calomel followed by black draught, and preceded by an emetic if the stomach is very foul; the eye to be frequently bathed with poppy decoction, or the weaker forms of F. 140, lukewarm or cold, according to the patient's choice; the edges of the eyelids to be smeared at night with fresh lard, and with weak ung. hydr. nit. ox. after the first day or two; a green shade to be worn over *both* eyes, whilst there is much intolerance of light; but the patient not to be confined to the house too long, unless the case is very severe, or the weather bad. In the catarrhal variety, a large drop of solution of arg. nit. (gr. ij.—iv. ad ℥i.) may be put into the eye twice or thrice a day. If there is much *pain*, leeches may be applied to the temples; and if the patient is plethoric, and there is much headache and fever, bleeding and calomel in repeated doses may be required. But it is a great mistake to treat common inflammation of the conjunctiva, when it occurs to delicate subjects, by lowering measures. After the bowels are cleared, a good diet, and exposure to moderate light and cool air, and an astringent lotion, will do more good than black draughts, leeches, and green shades.

II. INFLAMMATION OF THE WHOLE EYE is a rare disease. It may be caused by severe injuries, or surgical operations, or may be a consequence of the common ophthalmia, if neglected. The symptoms are, great redness and swelling of the conjunctiva; intense pain, both burning, aching, and throbbing; intolerance of light, dimness of vision, and severe headache and fever. It may lead to suppuration of the whole globe; or to opacity of the cornea and lens, adhesions of the iris, insensibility of the retina, and atrophy of the whole globe. The treatment must be decidedly antiphlogistic; and if it be clear that suppuration within the eyeball has occurred—there being rigours—the cornea yellow and distended, and excruciating pain unrelieved by further depletion, a free incision should be made into the cornea to let the matter escape.

III. CHRONIC INFLAMMATION OF THE CONJUNCTIVA may be a sequel of the acute; or may be caused by some local irritation, such as inverted eyelashes; or by some derangement of the health.

Treatment.—1. All local sources of irritation should be removed. 2. The general health should be amended, in the same manner as directed for chronic inflammation generally. (Vide p. 42.) 3. The distended capillaries must be unloaded by occasional leechings, and be excited to contract by stimulants and astringents, such as the various collyria in F. 140, &c., which should be used with an eye-cup; or the vinum opii, of which a few drops may be put into the eye daily. The edges of the eyelids should be smeared every night with weak ung. hydr. nit.; and blisters should be applied behind the ears, if the case is obstinate.

IV. PURULENT OPHTHALMIA, or *purulent conjunctivitis*, is the most violent form of inflammation of the conjunctiva, and is attended with a thick purulent discharge, which supervenes in from twenty-four to forty-eight hours after the commencement of the disease. There are three varieties of it:—1, the purulent ophthalmia of children; 2, the common purulent ophthalmia of adults; and 3, the gonorrhœal ophthalmia.

The PURULENT OPHTHALMIA OF CHILDREN, or *ophthalmia neonatorum*, always begins to appear a few days after birth; generally, on the third day.

Symptoms.—At first the edges of the lids appear red, and glued together; their internal surface is red and villous, and the eye is kept closed. Then the conjunctiva of the globe becomes intensely scarlet and much swelled, often so much so as to cause eversion of the lids; it secretes a thick purulent discharge, and the child is very restless and feverish. If neglected, this disease may occasion opacity or ulceration, or perhaps sloughing of the cornea; but it generally yields to early and proper treatment.

Causes.—The contact of gonorrhœal or leucorrhœal secretions from the vagina during birth; neglect in washing the natural cheesy secretion of the skin away from the eyes; together with exposure to cold and damp, and bad nursing. It rarely affects the children of the upper classes.

Treatment.—This disease, if submitted to early treatment, is easily cured by great attention to cleanliness, and by incessantly washing away the discharge with some mild astringent lotion. Either of the weak Collyria (F. 117) will answer; and a large drop of a solution of two grains of nitrate of silver to an ounce of distilled water may likewise be put between the lids once a day with a camel's hair pencil. The practice pursued at the Central London Ophthalmic Hospital, is to wipe away from the eye with a soft rag and warm water as much discharge as possible, then to apply with a rag a lotion of four grains of alum to an ounce of water; after that the edges of the lids are smeared with lard to prevent them from sticking together, and these proceedings are repeated every half hour. When the discharge is on the wane, the lids may be smeared at night with weak citrine ointment. The eye should be opened with very great delicacy; because if the cornea is beginning to suppurate, it might easily be burst, and the lens be squeezed out. Moreover, it is better to wash out the eye by everting the lids and using a bit of rag or sponge, than by injecting with a syringe, which would create a risk of splashing some of the discharge into the operator's eyes. The bowels should be cleared with a grain of calomel or gray powder, followed by a little castor oil or rhubarb ; and if the disease has been neglected, and there is great tumefaction, a leech may be applied to the upper eyelid, and half a grain of calomel be given every eight hours, for three or four doses. If the insides of the lids beome thickened, they must be treated as directed for *granular conjunctiva ;* and a few threads of cotton, spread with blistering plaster, may be laid between the external ear and the head, so as to create a discharge. If the cornea ulcerate or slough, or if the discharge be obstinate, tonics are required (quin. sulph. gr. fs.—vel ext. cinchon. gr. iii. ex lacte), and the astringent collyria should be persevered with.

V. PURULENT OPHTHALMIA IN ADULTS (*Contagious* or *Egyptian Ophthalmia*). *Symptoms.*—This disease begins with stiffness, itching, and watering of the eye, with a sense of dust in it, and slight swelling of the lids, which stick together during sleep; and on examination of their internal surface, the palpebral conjunctiva is found to be intensely red, thick, and villous, like a fœtal stomach injected. As the disease advances, the conjunctiva covering the globe becomes also intensely red, swollen, and villous, and discharges a copious secretion of pus. The swelling of the ocular conjunctiva is called *chemosis.* It is produced by a secretion of blood, lymph, and serum into the cellular tissue which connects the conjunctiva to the sclerotic; and it elevates the conjunctiva into a kind of roll around the margin of the cornea, which sometimes overlaps it entirely. These symptoms are accompanied with severe burning pain, extending to the cheek and temple, and great headache and fever; the palpebræ also are swollen, tense, and shining, so that the patient cannot open the eye.

Consequences.—This affection may lead to ulceration, or opacity, or perhaps sloughing of the cornea; or to adhesion of the iris; or to impairment of vision, from extension of inflammation to the internal parts of the globe.

Causes.—It may be produced by severe local irritation, as the introduction of lime, for instance. It is endemic in Egypt, owing to the glaring sunshine and the particles of sand with which the air is loaded. It may also be produced by the close damp atmosphere loaded with animal vapour that results from crowding many persons together in a confined space, and from the neglect of cleanliness and ventilation; hence its prevalence amongst the military in barracks; in schools; and on board ship; especially amongst the wretched inmates of slave-ships. But when once produced by any cause whatever, it is most probably both *contagious* and *infectious ;* that is, capable of being propagated both by contact with the purulent secretion, and by exposure to its vapour, if many persons affected with the disease are crowded together.

VI. Gonorrhœal Ophthalmia is the most violent form of purulent conjunctivitis. The *symptoms* are essentially the same as those of the last species; but the disease seems to begin in the ocular rather than in the palpebral conjunctiva, the chemosis is greater, the discharge thicker and more abundant, the constitutional disturbance more severe, and the cornea much more apt to slough. Fortunately one eye only is usually affected; not both, as in the Egyptian variety.

Cause.—This disease arises without doubt from the application of gonorrhœal matter from the urethra to the eye.

Prognosis.—This is very unfavourable. The sight of the affected eye will either be lost, or excessively impaired, unless treatment be very early and efficacious.

Diagnosis.—If a patient applies with violent conjunctivitis, and there is a suspicion that he has a clap and has infected his eye, the surgeon should insist on an examination of the penis, however strongly the patient may deny the fact of his having any disease.

Consequences.—The most frequent and detrimental is *sloughing of the cornea*, which is said to be caused by the constriction of its vessels by the chemosis. The sloughing generally occurs quite suddenly; the cornea may be clear in the morning—cloudy and flaccid in the evening—and by the next morning it may have burst; and this change may supervene at any time from the second day of the disease till the last. After this has occurred, the swelling of the lids subsides, the discharge diminishes and becomes thinner, and the pain greatly abates. If the slough is very small, the iris may protrude, and close the aperture, imperfect sight remaining,—but generally the greater part of the cornea perishes, and all useful sight is lost.

Treatment.—There are three sets of measures which may be adopted in this very hazardous disease; viz. antiphlogistic remedies, scarifications, and astringents.

Experience has shown that it is not possible to check this disease entirely by antiphlogistic measures, such as bleeding, purgatives, calomel and antimony, &c.; and that although they ought to be used in proportion to the violence of the fever with which the local disease is attended, yet that they cannot be trusted to entirely.

If the patient applies, at the very commencement, the use of a nitrate of silver lotion twice a day, and fomentations of poppy, with one grain of alum to the ounce, together with low diet, antimony, and confinement to bed, may suffice to check the disease.

But if the disease has reached its height, and there is great fever and headache, with full bounding pulse, it will be right to bleed freely, to purge, and to administer nauseating doses of antimony, and Dover's powder, at bed-time, to allay pain. The patient must be kept in bed in a darkened room, with the head elevated, and on low diet. But if these measures, combined with the local applications to be mentioned presently, do not arrest the disease, and the chemosis is evidently extending round the cornea, and the cornea is becoming hazy, six or eight incisions should be made completely through the swollen conjunctiva, beginning at the margin of the cornea, and radiating towards the circumference of the eye.* "A small curved bistoury must be introduced just where the chemosed conjunctiva overlaps the cornea, and the point be carried through the entire thickness of the swelling to the palpebral sinus, taking care not to injure the sclerotic coat, then the hand should be depressed, and the bistoury made to cut its way out. The incisions may be advantageously employed more than once in the same case, and are useful even when the conjunctiva is not entirely chemosed."† They should be fomented with warm water, that they may bleed. If there comes on, as frequently happens, an exacerbation of pain towards evening, it may be prevented by applying a few leeches in the afternoon, or by putting blisters behind the ears.

The eye should be frequently but gently washed out, by means of a piece of fine sponge, or syringe, with warm water or poppy decoction, containing a grain of alum to an ounce, in order to get rid of the purulent secretion; and once or twice daily, a few drops of a freshly made clear solution of two grains of nitrate of silver in an ounce of distilled water should be dropped into the eye by means of a camel's hair pencil. As soon as the chemosis begins to lessen, the proportion of alum in the poppy-water may be increased; or the weaker preparations of F. 140, may be used instead. The diet also should be improved, and the edges of the lids should be smeared at night with weak ung. hyd. nit. ox. If the strength becomes impaired, and the cornea has given way, tonics, especially bark or sarsaparilla should be administered, which, with repeated blisters, and a continuance of the astringent applications, are the measures for removing the relicks of the disease.

We must add, that a great variety of stimulating applications have been recommended at various times for the cure of this disease, such as liq. plumbi acet. undiluted, and the ol. terebinth. Mr. Guthrie in particular recommended an ointment of arg. nit. gr. x. liq. plumbi ♏xv. adipis ʒi., the nitrate to be very finely powdered, and the lard well washed. A piece of ointment the size of a pea, or a large drop of the solution on a hair pencil, to be thoroughly diffused between the lids and globe twice a day at the least. The ointment should turn the membrane white. But there is room for suspicion that very concentrated stimulants render the eye susceptible to chronic inflammation and granular conjunctiva afterwards.

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* This practice was revived by Mr. Tyrrell (Vide Med. Chir. Trans. vol. xxi. Part II., and Tyrrell on the Eye, vol. i. p. 73). It is mentioned by Astruc in the following terms. "It was thought proper some time ago to try the same remedy in the eye tending to a mortification, as is made use of in other parts of the body when they are threatened with the same disease; viz. to *scarify the swelled conjunctiva thick and deep*, so that the globe of the eye, and especially the cornea, might be less compressed by it; for that sudden destruction of the eye seemed to be chiefly owing to its being too tightly embraced by the swelled conjunctiva." Astruc on the Venereal Disease, translated from the Latin, Lond. 1754.

† Haynes Walton, Med. Times. Nov. 1848.

VII. SCROFULOUS OPHTHALMIA (*phlyctenular ophthalmia*) generally attacks children under eight years of age, but is not uncommon in adults.

Symptoms.—Extreme intolerance of light; the lids spasmodically closed; the head turned obstinately away from the light; no general vascularity of the conjunctiva, but one or two enlarged vessels running towards the cornea, and terminating at one or more *phlyctenulæ*, or small opake pimples (or sometimes pustules) at the margin of the cornea. This, like other scrofulous diseases, is extremely obstinate, and liable to recur frequently.

Treatment.—The first and chief point is to look after the general health. The alimentary canal, therefore, should be cleared by an emetic and dose of calomel and jalap, and, after feverishness has subsided, recourse must be had to tonics, aperients, and antacids, and to the other general remedies directed for scrofula. Quinine is particularly recommended by Mackenzie, and a combination of quinine with sulphate of iron (F. 16, &c.) by Mr. Walton; the sulphate of beberine by Dr. H. L. Williams. Pure air is essential. *Secondly.* Various applications are recommended to relieve the distressing intolerance of light, such as cold lotions applied to the outside of the eye, and to the forehead and temples; or water to which a little vinegar or spirit, or nitric æther has been added; or the white of egg curdled with alum, or warm poultices, or dec. papav. vel anthemid., or exposing the eye to the vapour of warm water, or to the vapour of laudanum or sp. camph., which may be put into a teacup and be held in warm water; or warm lotions of ext. belladon. vel hyoscyami (℈i. ad ℥j. aquæ), or those extracts smeared on the brow, and small doses of extract of conium internally. But the use of local applications is doubtful. *Both* eyes should be protected by a shade. *Thirdly*, in the advanced stage of the disease, benefit may be derived from dropping in a few drops of vin. opii or lotion of nitrate of silver (gr. i. ad ℥i.) once a day.

VIII. GRANULAR CONJUNCTIVA signifies a thick, rough, fleshy, state of that membrane (especially of that part of it which lines the eyelids), and is a frequent consequence of severe and long-continued ophthalmia, or probably of treatment by applications of too irritating a kind. It does not depend, as its name would seem to imply, on the formation of granulations, but on an hypertrophy of the villous surface of the mucous membrane. It causes great pain and disturbance to the motions of the eye, and, if it continues, will render the cornea opake by its friction.

Treatment.—The directions generally given are, that the thickened part should be scarified; then, after one or two days, it should be touched with lunar caustic or sulphate of copper, and the scarification and caustic should be repeated alternately at intervals of two or three days, and that, if these measures prove fruitless, the thinnest possible layer of the granular surface should be shaved off with a fine knife or scissors. But it is probably a sounder plan of treatment to use soothing applications, and mild astringents that do not irritate, especially if this state of conjunctiva follows an attack of inflammation that has been freely treated by caustic. When it results from long-continued ophthalmia, in a debilitated system, in which form it is rare, tonics and mild astringents are the remedies.

IX. Pterygium is a peculiar alteration of the conjunctiva, a triangular portion of which, with the apex towards the cornea, becomes thickened and elevated, sometimes transparent, sometimes red and fleshy. It may spread over the cornea and obstruct vision; but it does not give much inconvenience besides, and is not essentially an inflammatory affection, although it sometimes follows protracted ophthalmia.

Treatment.—If it does not disappear under the use of vin. opii or caustic lotion, it must be completely scarified across; and if that fail, it must be seized with a hook and be extirpated with curved scissors.

SECTION V.—OF THE DISEASES OF THE CORNEA.

I. Acute Inflammation of the Cornea, or *acute corneitis*, is generally a consequence of neglected injury. The part becomes red and opake, the sclerotic around highly vascular; and ulceration of the cornea, or suppuration between its layers, or abscess of the anterior chamber, may ensue. Local and general bleeding, mercury and antimony, or turpentine in the dose of one drachm three times a day, in an emulsion with carbonate of soda and mucilage, F. 74, and fomentations, are the remedies. Stimulating applications are prejudicial.

II. Scrofulous Corneitis most frequently occurs between the ages of eight and eighteen.

Symptoms.—The cornea opake, rough, and red, and unusually prominent; the surrounding sclerotic also red; pain and intolerance of light are generally trivial; there is some tendency to inflammation of the iris and retina; the pulse is frequent, and the skin dry.

Treatment.—For the acute, purgatives and fomentations. For the chronic, quinine perseveringly administered; blisters repeatedly applied to the nape of the neck, and behind the ears; and the general tonic treatment directed for scrofula. The vin. opii, and ung. hydr. nit. ox. to the eyelids are almost the only local applications admissible.

III. Opacity of the cornea may be divided into two kinds. 1st. The opacity which results from the Adhesive Inflammation, and effusion of fibrine between its layers, or between it and the conjunctiva, which is a very common consequence of inflammation of the cornea, and of scrofulous ulcers during their healing stage; and 2dly, the opacity, or *leucoma*, which is produced by a loss of substance and its resulting cicatrix,—that which follows a pustule of the small-pox for example. The former kind is in most cases curable: the latter generally not so.

When an opacity of the former kind is slight and diffused, it is called *nebula;* when denser and of a firmer aspect, *albugo.* Sometimes the lymph forming an albugo becomes vascular, and one or more vessels run to it from the circumference of the eye, and the cornea becomes red and fleshy: this state of things is called *pannus.*

Treatment.—1. All sorts of irritation about the eye or lids (inverted hairs, granular conjunctiva, &c.) must be removed, and any existing degree of inflammation be counteracted by proper measures. Then, 2, absorption of the lymph may be promoted by counter-irritants, such as blisters and the tartar emetic ointment; by alteratives and measures calculated to improve the health; and by the application of stimulants to the eye. The ordinary applications are, caustic lotion (gr. ii. ad ℥j.), or hydr. bichlor. gr. i.—ad aq. ℥j.; vin. opii; or, ung. hydr. nit. ox. Whichever is selected should not excite long-continued pain or active inflammation. Gooch used to cure opacity of the cornea, even of long standing, and, in fact, other forms of chronic inflammation of the eye, by the administration of corrosive sublimate, in doses that would now be considered hazardous. He gave gr. $\frac{1}{4}$ twice a day; and in a few days' time increased the dose to gr. $\frac{1}{2}$, and then to gr. i. It caused feverishness, purging, slight sweating, and headache.

IV. LEUCOMA signifies an opake cicatrix of the cornea. If recent, it may be partially removed by the measures just indicated for the cure of the opacity arising from adhesive inflammation. If of long standing, it is irremediable, and sometimes becomes the seat of calcareous degeneration, a small particle of earthy matter being found in it, which may require removal because of its friction against the eyelids. Should *both* eyes be affected with leucoma, and should the opacity be exactly in front of the pupil, it will be right to make an artificial opening in the iris opposite some part of the cornea that is transparent.

Mr. Bowman has described a case of *warty opacity*, caused by the development of vascular papillæ, covered with hypertrophied epithelium; and relieved by shaving off the morbid growth to the level of the healthy cornea.*

Superficial Opacities.—"There are some varieties," says Mr. Bowman, "which appear to be on or near the very surface of the cornea, and which it is probable may occupy the anterior elastic lamina. The very opake chalky-looking films which often follow the application of quicklime or new mortar to the eye, seem to be of this kind, and so, also, do those which have been supposed by some to be stainings of the surface of the corneal tissue by a deposit of the lead lotion in common use. Occasionally we have a superficial excoriation of the cornea—one can hardly call it an ulcer—which the epithelium limits with abrupt edges, thus favouring the accumulation, on the depressed surface, of the frothy mucus or sud which the movements of the lid furnish.

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* Op. cit. pp. 39, 122.

"The opacity thus produced is often very opake, and unless you were aware of its cause, might seem more serious than it really is. A lens, or the point of a needle, will inform you of its real nature.

"There is another form of opacity, which I believe to have its seat in the anterior elastic lamina, although it is vain to endeavour to prove it, except by a section of the parts. It has a silvery lustre, and a very fine texture of interweaving striæ, and it creeps very gradually from near the border, over the surface of the cornea, towards the centre. The epithelial surface retains its smoothness and lustre, and the opacity does not appear to have much depth. Other varieties of opacity, very chronic in their course, and evidently not inflammatory, are liable to form, as I believe, in the same tissue. They may be of a brown tint, with an indefinite margin, and may affect both corneæ at the same time."

Mr. Bowman relates two cases, one treated by himself, the other by Mr. Dixon, in which superficial opacity, caused by a thin film of earthy matter, was successfully removed by operation.*

V. ONYX signifies a suppuration between the layers of the cornea, and is an occasional result of acute ophthalmia, especially of the catarrho-rheumatic. It derives its name from its resemblance in shape to the white spot at the root of the finger-nail. It mostly disappears with proper antiphlogistic treatment. If it extend very fast, it may be necessary to puncture the external layers of the cornea, to relieve the great pain, but the sight will be lost.

VI. ULCERS of the cornea may be results of the *phlyctenulæ* of scrofulous ophthalmia, or they may arise from mechanical injury, or from any form of conjunctival inflammation. They may likewise commence as mere abrasions, or as little nebulous spots, independently of any other affection. When a consequence of the scrofulous phlyctenulæ, they are generally deep, and tend to perforate the cornea, and leave an opake cicatrix; when arising from other causes, they are often superficial, and heal with a semitransparent cicatrix, which gradually becomes clear.

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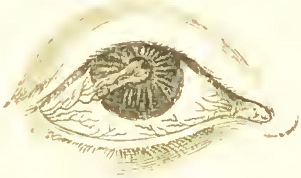

These ulcers may, as Mr. Tyrrell observes, exist in three states. "*First*, that which we may term healthy, when the surface and circumference exhibit a degree of haziness or opacity of a whitish or gray aspect, which is owing to the effusion of adhesive matter on the surface, and in the surrounding texture, which is essential to the healing of the part." In this state, the case merely requires to be watched, to prevent injurious increase of action.

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* Op. cit. pp. 37, 117.

† This figure exhibits the healing stage of an ulcer of the cornea. It is copied by Mr. W. Bagg from a drawing for which the author has to thank Mr. Partridge.

Secondly, an ulcer may be inflamed, when its hazy circumference will be observed to be highly vascular. Leeches and counter-irritation with soothing applications, are the remedies. But an ulcer is not necessarily inflamed, because it has red vessels going to it; these bring materials necessary for its repair, and are not morbid.

Thirdly, an ulcer may be indolent, clear, and transparent, looking as if a little bit had been cut out of the cornea; without any vascularity or effusion of lymph. This state requires stimulating applications (arg. nit. gr. i. ad aq. ℥i.)

Again, ulcers may form on a surface that is already rendered opake and nebulous by scrofulous inflammation. However, in any case, counter-irritation, and measures to improve the health, together with weak caustic lotion or vin. opii used twice a day, are the chief remedies. The surgeon should remember the tendency of the cornea to slough from insufficient and non-azotized food, as proved by the experiments of Majendie. The pupil should be dilated with belladonna, if the ulcer is near the centre of the cornea.

When an ulcer is very irritable, keeping up constant pain and intolerance of light, in spite of soothing applications, the best plan is to touch its surface with a finely-pointed pencil of nitrate of silver, so as to produce an insensible film on the surface; this is to be repeated at intervals of three or four days.

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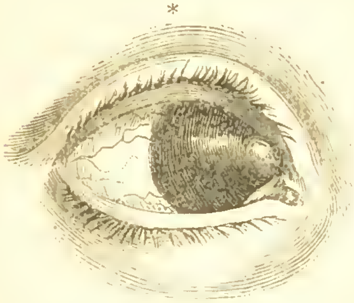

VII. STAPHYLOMA is a term employed to signify any protrusion on the anterior surface of the eye. 1. *Staphyloma iridis* signifies a protrusion of the iris, which occurs when the cornea is perforated by ulcers or wounds. The term *myocephalon* is applied to the protrusion of a very small piece of the iris through an ulcerated opening in the cornea. For the treatment, see p. 353.

2. *Staphyloma of the cornea* is said to exist when a portion or the whole of the cornea, whose texture has been disorganized by injury or disease, bulges before the pressure of the humours of the eye, and forms an opake, white prominence. If *partial*, it is usual to recommend that the nitrate of silver or butter of antimony be applied to the apex of the staphyloma, so that the inflammation excited may thicken the cornea, and enable it to resist further protrusion; the caustic to be well washed off with milk before the lids are closed. But besides sympathetically affecting the other eye, it is seldom that the use either of the nitrate of silver or butter of antimony checks the

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* Represents Staphyloma corneæ, from Dr. Westmacott's collection.

increase of staphyloma, and sooner or later the eye is collapsed from the necessary extensive use of the knife. Therefore, when the staphyloma is small, Mr. H. Walton shaves it off, at the same time evacuating with the curette a *small* amount of vitreous humour, by which means the cut part frequently cicatrizes and no further protrusion is effected. If the volume of the eye were not a little reduced by the loss of vitreous humour, during the healing process the new material that closed the aperture would also yield and become staphylomatous. This treatment is applicable to small staphylomata, and especially those that rise suddenly, and have a small, well-defined base. If *general*, the staphyloma should be shaved off, for, as it is not covered by the eyelids, it is a source of constant irritation and pain.

VIII. HERNIA CORNEÆ.—When the cornea is nearly or quite perforated by an ulcer, a thin, transparent vesicle is apt to protrude from the aperture, consisting of a thin lamella of the cornea ; or else of an imperfectly organized cicatrix protruded by the aqueous humour. It may be snipped off if large, and the place be touched with caustic ; but it is apt to be reproduced very rapidly.

IX. CONICAL CORNEA.—In this curious affection, the cornea seems to become weak in its structure, so as to bulge out under an increased secretion of aqueous humour. It gradually becomes thin and exceeding convex, but remains transparent, and it often gives a peculiarly brilliant appearance to the eye. As it increases, it causes almost total deprivation of vision, which, however, can be partially remedied by looking through a minute aperture in a piece of blackened wood. It is generally considered incurable, but Dr. Pickford of Brighton has published cases relieved by a long course of emetics and purgatives.* Tonics and counter-irritants may also be of service. *Vide* Artificial Pupil, p. 376.

CAUTION.—If the *acetate of lead* is used as a collyrium when there is any abrasion of the conjunctiva or cornea, a white precipitate is formed, which is liable to become fixed in the cicatrix as a dense white spot. The film may, however, sometimes be removed by a needle. The *nitrate of silver*, if applied too long, is apt to turn the conjunctiva to a deep olive hue.

SECTION VI.—DISEASES OF THE SCLEROTIC.

I. ACUTE INFLAMMATION OF THE SCLEROTIC is commonly called RHEUMATIC OPHTHALMIA ; because the structure affected is similar to that which is attacked by rheumatism ; but it is not certain that the kind of inflammation present is always the genuine rheumatic.

Symptoms.—It is known by redness of the sclerotic,—no great intolerance of light,—severe stinging pain of the eye, and aching of the bones around, which is greatly aggravated at night,—and fever. It may be caused by cold, and sometimes, like other rheumatic inflammations, is a sequel of gonorrhœa; but it is a rare disease. It may lead to opacity of the cornea, or to iritis.

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* Pickford on Conical Cornea. Dublin Journal Med. Sc., Jan. 1844.

Diagnosis.—This form of ophthalmia may be distinguished from inflammation of the conjunctiva, 1st, by the character of the pain; which is a severe aching, principally felt in the eyebrow, temple, and cheek; and is greatly aggravated every evening; being excessively severe during the night, but remitting towards morning. Whereas in conjunctivitis, the pain is of a scalding nature, and accompanied with a sensation as if sand was in the eye. 2ndly, By the character of the redness; which is deep-seated, and of a pale pink; and by the vessels running in straight lines from the circumference of the eye towards the cornea; whereas in conjunctivitis the redness is scarlet and superficial, and more vivid; the vessels are tortuous, and freely anastomose, and can be moved about with the finger.

Treatment.—In severe cases, it may be necessary to bleed generally or locally: at all events, to purge, and administer colchicum, F. 71; or perhaps calomel and opium till the gums begin to suffer. The other measures are, friction of the forehead every afternoon, with extract of belladonna dissolved in warm laudanum (ʒj ad ℥j), or with mercurial ointment and opium,—warm pediluvia, or warm bath,—blisters behind the ears,—and Dover's powder at bedtime. Subsequently tonics will be useful, especially a combination of dried carbonate of soda and powdered bark, five grains of each of which may be given every four hours. Dry warmth, by means of muslin bags, filled with chamomile flowers and heated on a hot plate, is the most soothing local application.

II. CATARRHO-RHEUMATIC OPHTHALMIA is a combination of inflammation of the sclerotic with that of the conjunctiva. The symptoms of conjunctivitis, that is to say, roughness and sense of dust in the eye,—muco-purulent discharge and superficial scarlet redness,—are combined with the deeper-seated, straight-lined redness, and with the zone around the cornea, and fits of nocturnal aching, that characterize inflammation of the sclerotic. This disease is very apt to lead to onyx, and to ulceration of the cornea, and suppuration in the anterior chamber.

Treatment.—Astringent collyria, scarifications, weak citrine ointment, and the other topical applications for conjunctival inflammation, must be used in addition to bleeding, calomel and opium, and the other remedies prescribed for simple inflammation of the sclerotic.

SECTION VII.—INFLAMMATION OF THE ANTERIOR CHAMBER, OR AQUO-CAPSULITIS.[*]

Symptoms.—Slight haziness of the central portion of the posterior layer of the cornea, interspersed with grayish specks, the larger of which are about the size of a small pin's head; without any attendant vascularity. There is an increase of aqueous secretion, and the cornea becomes unnaturally convex. The iris is rarely implicated, though it may look dull because viewed through an opake cornea. When it is so, the pupil becomes sluggish, and in aggravated cases, there is effusion of lymph into it and into the texture of the iris. *Hypopion* (an effusion of puriform fluid into the anterior chamber) may occur.

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[*] The anterior chamber is sometimes the residence of a parasitic animalcule. For an account of such a case, treated successfully, by Dr. Mackenzie, see Med. Chir. Trans. vol. xxxii.

Treatment.—Hydrarg. c. creta with James's powder; and belladonna to the eye. In weakly and scrofulous persons, who are usually the subjects of this disease, the system will require support whilst the mercury is given.

SECTION VIII.—OF THE DISEASES OF THE IRIS.

I. INFLAMMATION OF THE IRIS, or IRITIS.—The iris being muscular in its structure, and covered with a serous membrane, is exceedingly liable to inflammation of an adhesive character, which frequently involves also the sclerotic, the anterior capsule of the lens, and the deeper structures in the eyeball.

Symptoms.—In the first stage, the fibrous texture of the iris appears confused, and it loses its colour; if dark, it becomes reddish; if blue, it becomes greenish. The pupil, also, is contracted and irregular. In the next stage, lymph begins to be effused; sometimes in the form of a thin layer, causing the surface to appear rusty and villous,—sometimes in small nodules; sometimes the pupil is filled with a film of it,—sometimes it is poured out in such abundance as to fill the whole cavity of the aqueous humour. The eye displays that kind of redness which arises from vascularity of the sclerotic; that is to say, a pink redness, with vessels running in straight lines from the circumference of the eye, and terminating in a vascular zone around the cornea; but in very acute cases the conjunctiva becomes injected likewise. The patient complains of intolerance of light and dimness of vision, and of more or less burning, stinging pain in the eye; but besides this, there is also a severe aching of the brow and parts around the orbit, coming on in nocturnal paroxysms, as in the rheumatic ophthalmia, and depending probably on an affection of the orbitar periosteum and surrounding fasciæ.

Causes.—Iritis may be caused by injuries, or by over-exertion of the eye; but it more frequently depends on constitutional taint, syphilis, or gout.

Prognosis.—Favourable, if the disease is recent and confined to the iris, although the impairment of vision may be considerable; but doubtful, if it be of long duration (*i. e.* more than a fortnight); if there be much deep-seated pain, and especially if there be effusion of lymph behind the iris.

Varieties.—Iritis may vary in the degree of acute inflammation which attends it; being active and rapid, attended with bright redness, great pain, and fever if it occurs in a robust plethoric subject;

but in other cases, slow and insidious. It is also divided into several species, according to the nature of the cause producing it. Thus, 1. The *traumatic iritis* is that which arises from penetrating wounds of the eye. 2. The *rheumatic iritis* arises from cold; although, like the rheumatic sclerotitis, it does not necessarily occur in persons who have suffered from rheumatism previously. 3. *Syphilitic iritis.*—This is the most frequent variety. It is said to be distinguished by the pupil being displaced upwards and inwards, and by the effusion of lymph in little nodules of a reddish or dirty brown colour, which cause the pupil to become angular. There is great pain at night, and but little by day, and secondary venereal affections of the throat and skin are usually present at the same time. 4. The *arthritic*, or *gouty iritis*, is an asthenic form, generally occurring to elderly dyspeptics and sots. It is said to be distinguished by the atonic dusky hue of the redness; and the varicose state of the blood-vessels; and there is also sometimes a narrow white ring or interval of sclerotica between the red vascular zone and the cornea; but Mackenzie says that the same is seen also in the other varieties of iritis if occurring to old people; moreover, it is seen in all inflammations of the eye, when the conjunctiva and sclerotic are much injected, and the cornea clear and not vascular. There is great pain around the eye; and the patient will generally be found to have laboured under irregular gout, and various forms of asthenic dyspepsia. 5. *Scrofulous iritis.*—This is generally an extension of disease from the external tunics in neglected cases of strumous ophthalmia; but iritis sometimes, although rarely, occurs in young scrofulous subjects as a primary affection.

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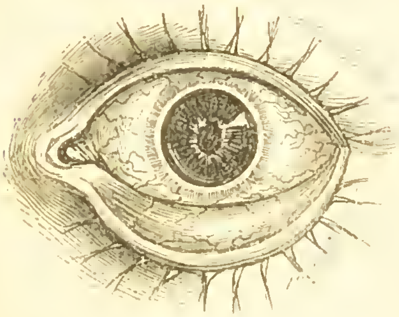

Treatment.—The indications are, 1, to subdue inflammation; 2, to arrest the effusion of lymph, and cause absorption of what is already effused; 3, to preserve the pupil entire; 4, to allay pain.

1. If the patient be strong, and the disease acute, with full strong pulse and much fever, bleeding from the arm, or cupping from the temple may be requisite. The bowels must be well cleared, the antiphlogistic regimen generally be observed, without bringing the patient into a state of debility, and blisters be applied after the most acute stage has subsided.

2. To fulfil the second indication, the principal remedy is mercury; given in such a manner as gently to affect the mouth; such as

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* From a drawing in the possession of Dr. Westmacott. It represents the nodules of lymph effused in syphilitic iritis.

gr. i—ii of calomel with gr. $\frac{1}{4}$—$\frac{1}{2}$ of opium at intervals of from four to eight hours. And when the mouth begins to become sore, the lymph will generally be found to break up and gradually disappear, leaving the pupil clear. The surgeon should endeavour to avail himself of the curative, without the poisonous effects of the drug, and should recollect that violent salivation is a great evil. Small doses of hyd. c. creta, thrice daily, produce every desired effect in the hands of some surgeons. In debilitated subjects tonics may be given with the mercury. Turpentine in drachm doses, F. 74, has been recommended in iritis instead of mercury; but its efficacy admits of doubt.

3. The pupil should be kept well dilated by means of extract of belladonna, a thick solution of which should be painted on the eyelids during the acute stage; and a filtered solution of one scruple in an ounce of distilled water may be dropped into the eye afterwards. But the most elegant means of obtaining the effect of belladonna is to drop into the eye a solution of the *sulphate of atropine*, (gr. i. ad ℥i aquæ distill.) Stramonium or hyoscyamus may be substituted if preferred.

4. The pain must be relieved by nightly doses of opium, and the application of poppy fomentation to the eye.

In *gouty iritis*, calomel is only to be used in order to evacuate the bowels and amend the secretions, and it is highly injurious if given to the extent of affecting the system. But colchicum with alkalis and purgatives, or turpentine, and counter-irritants are the best remedies. Pediluvia containing mustard should be used every night.

II. SYNECHIA POSTERIOR, adhesion of the *uvea* to the capsule of the lens; SYNECHIA ANTERIOR, adhesion of the iris to the cornea; and ATRESIA IRIDIS, or closure of the pupil,—three consequences of organization of lymph from protracted iritis,—may be partially removed by mercury if recent, but are irremedial, except by operation, if of long standing. But belladonna should always be applied; because if a very small portion of the pupil is by chance unadherent, it may be dilated so as to afford a very useful degree of vision.

III. MYOSIS—a preternaturally contracted pupil—is sometimes met with in persons accustomed to look at minute objects, and is attended with great obscurity of vision, especially in a feeble light, because the iris is unable to dilate. To give repose to the eyes, and attend to the health, are the only available indications of treatment; Mackenzie says that belladonna is hurtful.

IV. MYDRIASIS signifies a preternatural dilatation of the pupil, which does not contract on exposure to light. This state, as is well known, is readily produced by belladonna and many other narcotico-acrid poisons; it is caused also by any injury of the brain affecting the *tubercula quadrigemina*, as in apoplexy and compression of the brain; and is an attendant of confirmed amaurosis. But sometimes it depends simply on a derangement of the nerves supplying the iris, without any diminution of the sensibility of the retina; and this form of it may also be attended with ptosis; as a further evidence of paralysis of the third nerve. Sometimes it depends on gastric irritation and general debility, and is improved as the health improves. If the retina is sound, which will be known by the perception of light, and by vision being improved by looking through a small round aperture in a piece of blackened card, concave glasses are often of service. Irritating applications to the eye have been recommended, but their utility is doubtful. One case is recorded which was said to be cured by ergot of rye, in scruple doses four times a day.*

V. TUMOURS or CYSTS growing upon the iris must be removed if they become large, so as to interfere with vision, or to inflame the eye by their pressure. A section of the cornea must be made as for extraction of cataract, and the diseased part of the iris, having been drawn out, must be snipped off.

VI. ARTIFICIAL PUPIL.—There are certain cases in which it becomes expedient to alter the shape and position of the pupil, or to form a new pupillary aperture in the iris.†

1st. In cases of conical cornea, or of permanent opacity of the centre of the cornea, it is advisable to bring the pupil opposite to a transparent part of it; and Mr. Tyrrell observes, that if the position and extent of the opacity do not forbid, the pupil should always be brought downwards and outwards. This is done in the following way; a broad needle is carefully passed through the cornea, close to its junction with the sclerotic. Through the puncture thus made, Tyrrell's hook, a fine blunt hook with a long bend, is passed into the anterior chamber, with the bent limb forwards. As soon as it has reached the pupillary margin, the hook is turned backwards so as to catch it; and then the hook is withdrawn through the corneal puncture, bringing out the iris with it, and of course rendering the pupil oblong. The piece of the iris that protrudes should be snipped off with a fine pair of scissors.

2ndly. In cases where the pupil has been nearly or altogether lost in consequence of prolapse of the iris through wounds or ulcers, or slough of the cornea; or where vision is obscured by opacity of the cornea, with adhesion of the iris to it; or by partial staphyloma of the cornea, with adhesion of the iris; a new pupillary aperture may be made; or the old pupil (if not quite abolished) may be extended opposite to that part of the cornea which remains transparent, by the same operation which we have just described. But if the old pupil is quite lost, it will be necessary to make a little puncture of the iris with the needle which is employed to puncture the cornea; into which puncture of the iris the hook is to be inserted. Supposing, moreover, that after either of these operations the new pupil degenerates into a mere slit, this slit must be enlarged, by another operation of the same kind—that is, by making another puncture of the cornea at a little distance above the first, and dragging up the upper margin of the slit with the hook.

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* L'Expérience, Sept. 1839.

† This operation, when performed by means of an incision in the iris, is technically called *coretomia;* when performed by the excision of a little piece, it is called *corectomia;* and when effected by detaching the iris from the ciliary ligament, it is called *coredialysis.* (Κόρη, *pupilla.*) The last operation is too violent.

3rdly. In cases where the pupil has closed after the removal of a cataract, whether in consequence of prolapse of the iris, or of inflammation and organization of lymph, an artificial pupil may be made, after Mr. H. Walton's method, by dividing the iris perpendicularly through the cornea with a lancet-shaped knife of small dimensions. When the iris is sufficiently healthy, it retracts sufficiently on being divided; when it is much changed by inflammation, the iris is incised by a similar knife, rather nearer to its inner side, and the outer edge of the incision is dragged outwards with a blunt pick. Mr. Haynes Walton calls the former of these operations, *the operation by incision*, the latter, *by incision with extension.*[*]

But before resorting to any of these operations, it must be ascertained, 1st, whether the adhesions of the iris cannot be removed by mercury or belladonna, or opacity of the cornea by external applications, aided by *time*, which if the health be kept in good order, does much towards restoring every impaired organ to its normal condition; 2ndly, that the retina is perfectly sound; 3rdly, that all tendency to inflammation (syphilitic or otherwise) has ceased. It is not advisable to operate if one eye be quite sound; and supposing one eye to be irrecoverably lost, it is not advisable to form an artificial pupil in the other, provided the patient find his way about with it. Moreover, the new pupil should be made large, because it will always contract somewhat afterwards.

SECTION IX.—INFLAMMATION OF THE CAPSULE OF THE CRYSTALLINE LENS.

This is a very rare affection, and always chronic. Vision is confused,—objects looking as if they were seen through a fine gauze. On examining the eye with a strong lens in a good light, the pupil being well dilated with belladonna, a number of minute red vessels are seen in the pupil. If the anterior capsule be affected, the vessels form a circular wreath of vascular arches with the centre clear; if it be the posterior capsule, they are central and arborescent. The iris is always slightly discoloured and sluggish.

Treatment.—Local or general bleeding; mercury, counter-irritation, change of air, and alteratives.

SECTION X.—OF CATARACT.

Definition.—An opacity of the crystalline lens or its capsule.

Symptoms.—Before examining any patient with suspected cataract, the pupil should be dilated with belladonna, and then, if there be cataract, there will be seen an opake body of a gray, bluish-white, or amber-colour behind the pupil. The patient usually gives as his history, that his vision has become gradually impaired; that objects appear as if surrounded with a mist, or as if a cloud was interposed between them and the eye; and that the sight is better in the evening, or when the back is turned to the window; or after the application of belladonna,—obviously because the pupil, being dilated under those circumstances, permits more light to pass through that part of the lens which is yet transparent. In the most confirmed cases, the patient is able to distinguish day from night.

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[*] Vide Lecture, Med. Times for 1849, p. 331.

There is also the *catoptric test*,—that is, the mode of examining the eye by the reflection of light, which was proposed by M. Sanson. When a lighted taper is moved before the eye of a healthy person, three images of it may be observed. 1st. An erect image, that moves upwards when the candle is moved upwards, and that is produced by reflection from the surface of the cornea. 2ndly. Another erect image, produced by reflection from the anterior surface of the crystalline lens, which also moves upwards when the candle is moved upwards; and, 3rdly. A very small inverted image, that is reflected from the posterior surface of the crystalline lens, and that moves downwards when the candle is raised upwards. Now, in cataract, this inverted image is from the first rendered indistinct, and soon abolished; and the deep erect one is soon afterwards abolished also.

DIAGNOSIS will be spoken of under Amaurosis and Glaucoma.

CAUSES.—Cataract (especially of the capsule) is sometimes attributable to inflammation, and may be caused in a short space of time by wounds or other injuries of the lens. But the ordinary cataract of the old seems to be a mere effect of impaired nutrition.

VARIETIES.—1. *Hard* cataract. This is the form that is met with in elderly people.* There is an appreciable interval between the lens and iris. 2. *Radiated* cataract. In this form, the opacity commences in streaks at the circumference, which, as the disease advances, slowly converge towards the centre. In this variety there is of course some little diversity from the ordinary symptoms. For instance, the patient sees best in a bright light, when the pupil is contracted; and, moreover, he is apt to see objects double, or distorted, in consequence of irregular reflections of light from the opake streaks. 3. *Soft* cataract,—the lens of the consistence of soft cheese or cream, and of a gray or bluish, or pure white colour, without any amber tint. This variety is generally met with in congenital cases, and, in fact, in all persons under forty; it causes a greater degree of blindness than the hard variety; moreover, the lens, being swelled, projects against the iris, and interferes with its motions. 4. *Capsular* cataract. Opacity of the capsule is said to occur in spots or streaks, with less opake intervals. It is not unfrequently the result of a slow inflammation, which may be accompanied with pain in the eye, and signs of congestion in the head; it may be produced also by inflammation extending from the iris or conjunctiva. Opacity of the *anterior* portion may be seen immediately behind the iris, and has a glistening, chalky, or pearly white appearance. That of the *posterior* appears at some little distance behind the pupil, and presents a concave striated surface, of a dull yellowish appearance. 5. *Capsulo-lenticular* cataract is very common,—in fact, entire opacity of the capsule is always followed by opacity of the lens.

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* The author is indebted to Mr. H. Walton for the following note. "It is common to say that in this form of cataract, the lens is shrunken, hard, and amber-coloured. First as to the shrinking. The fact is, that in the aged, especially when there is cataract, the outer portion of the lens is readily removed, and leaves the central or harder part. Again, when cataracts are preserved, little more than the central portion is seen, for the soft exterior separates, making turbid the liquid in which they are pickled. Moreover in extraction, when the lens is escaping through the cornea, the soft part is not unfrequently left behind, and the nucleus only gets out. Next as to the hardness,—Cataract *is merely opacity pervading a lens*, but the opacity has no power to create hardness, and the cataract of an old person is not harder than the lens of that person would have been in a transparent state. Hence we never see hard cataract before that time of life when the lens begins to be more dense. Lastly, The amber colour of cataract in the aged is caused by opacity affecting an amber-coloured lens. After thirty the lens begins to be coloured, and gets a deeper hue till it is like a piece of amber."

Treatment.—The cataract must be removed by operation. No other treatment is of any avail to get rid of the disease, although perhaps its progress may be retarded by counter-irritation, and stimulating applications to increase the flow of tears, and sternutatories. It is, however, a general rule not to operate till the cataract is *mature*,—that is, not whilst the degree of vision is sufficient for ordinary purposes; more particularly if the patient is very old and feeble, or if one eye is already lost; because under these circumstances a failure of the operation would entail utter blindness. Therefore the patient should assist his vision by dropping into the eye one or two drops of a carefully filtered solution of extract of belladonna (℈i. ad ℥i.) in distilled water, night and morning, so as to dilate the pupil, and defer the operation till, despite of that aid, his blindness is complete.

Prognosis.—This will be favourable if the patient is in good health, of a spare frame and temperate habits; if the iris moves freely, and if the retina seems perfectly sensible to light. On the other hand, it will be doubtful if there are signs of vascular disturbance in the eye or head—if the iris is motionless or altered in colour, or if it is adherent to the capsule; or if the cataract is complicated with amaurosis, synchysis, or glaucoma.

Preparation.—Before operating, the patient should be put into as perfect a state of health as possible. The bowels should be cleared, the secretions be regulated, and bleeding and low diet be enjoined if the habit is inflammatory. Moreover, the operation should always be performed in mild weather.

There are three methods of operating;—1. extraction; 2. depression (or *couching*); and, 3. the operation for causing absorption.

1. Extraction.—The object of this operation is, to make an incision through half of the circumference of the cornea, almost close to the sclerotic; to lacerate the capsule of the lens; and then to extract the cataract entire, through the pupil. Its advantage is, that it effectually removes the cataract; its disadvantage, that in the event of a failure sight is almost irretrievably lost. It is best adapted for hard cataracts in elderly people. But it should not be attempted, 1st, if the patient is very old and feeble, in case the wound of the cornea might not unite. 2ndly. If the anterior chamber is very small and the cornea very flat, so that a sufficiently large opening cannot be made in it. 3rdly. If the iris adheres much to the cornea, or if the cataract is large and pushes it forwards, or if the pupil is habitually contracted. 4thly. If the eye is sunken, or if the fissure of the lids is preternaturally small. 5thly. If the eyes are very unsteady, or if the patient is subject to habitual cough or asthma, or is unmanageable in consequence of infancy or idiocy. Some practitioners direct that one eye only should be operated on at a time, the other being kept as a reserve, whilst others are not afraid to operate on both together.

Preliminaries.—The patient should be seated in a low chair with a high back, opposite a window that admits a good clear light, but no sunshine, and the eye to be operated upon should be turned somewhat obliquely to the window, so that the operator may not see the image of it on the cornea. The surgeon should sit immediately before the patient on a higher chair; and should have a stool, so as to raise one knee to a proper height for steadying the elbow of the operating hand upon it. Behind the patient an assistant should stand, whose duties are 1st, to steady the head against the back of the chair, or against his own breast. 2ndly. To elevate the upper eyelid, and fix it against the margin of the orbit, with one forefinger. 3rdly. To drop it at a preconcerted signal from the surgeon.

Operation.—The surgeon, 1st, depresses the lower eyelid, and steadies the globe with the fore and middle fingers of one hand, but without exerting any pressure on it. He particularly endeavours to prevent it from rolling inwards during the operation. 2ndly, holding the *cornea-knife** like a pen (in the right hand for the left eye, and *vice versâ*), and resting the other fingers on the patient's cheek, he touches the cornea once or twice with the flat part of the blade, in order to take off the patient's alarm. 3rdly. He *punctures the cornea* close to its outer margin, pushing the point of the blade perpendicularly towards the iris, and not obliquely; otherwise it would pass between the laminæ of the cornea instead of entering the anterior chamber. 4thly. He must push it steadily across parallel to the iris, till it cuts its way out, making a semicircular flap of the lower half of the cornea; immediately upon which the eyelid should be dropped. 5thly. Waiting a few seconds, the surgeon takes a *curette*,—introduces the pointed end with the convexity upwards, and freely lacerates the capsule with it; and then withdraws it with the convexity downwards. 6thly. He makes *very gentle* pressure on the under part of the globe, and on the upper eyelid, till the lens rises through the pupil and escapes. Lastly, the eye should be opened after a minute or two, to see that the flap of the cornea is rightly adjusted, and that the iris is not prolapsed: if it is, the eyes should be exposed to a bright light, so as to make the pupil contract, and the prolapsed portion should be gently pressed upon with the spoon of the curette. Then the operation is finished.

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* The knife called Beer's is most used. It has a triangular blade, the point sharp, the back straight and blunt, the edge slanting obliquely, and the blade increasing in breadth and thickness as it approaches the handle. The advantages of this shape are, that it fills up the incision which it makes, and prevents the escape of the aqueous humour; and that the flap of the cornea is made by one simple motion, that is, by pushing the knife inwards.

It follows as a matter of necessity, that there must be many variations in the manner of performing an operation comprising so many minute and delicate manœuvres as the one under consideration. Thus, if the surgeon be ambidexter, he may sit before his patient, when operating on either eye; but, if he can use his right hand only, he must sit behind his patient when operating on the right eye. Many surgeons make a flap of the upper half of the cornea, as represented in the next engraving, instead of the lower half. "The advantages of this operation," says Mr. Lawrence, "are, that the operator has a more complete control over the globe; he can fix it very perfectly; that the aqueous humour does not escape so readily, and consequently that the section of the cornea is more readily accomplished; that there is less chance of prolapsus iridis; and that the upper lid keeps the flap of the cornea in exact apposition." If the surgeon have perfect use of the left hand, so that he can operate on the left eye with it, so much the better. There are commonly two or three failures, after extraction in the left eye, to one in the right, simply because the left eye is not so well operated on. Some operators again, dispense entirely with an assistant, and fix the globe with the left hand. Mr. Guthrie also objects to making the puncture of the cornea

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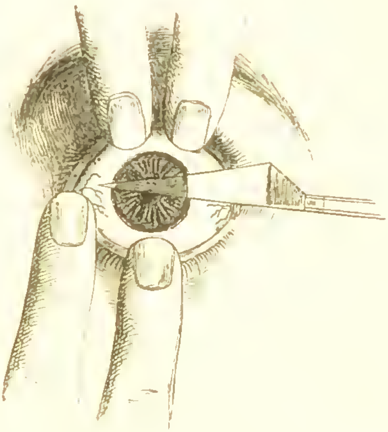

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[*] The above cut must only be considered as conveying an idea of the operation. The knife represented is too long and not broad enough.

with the knife perpendicular to the eye. Some operators use belladonna to dilate the pupil; others are averse to it.

Complications.—1. Sometimes, in consequence of the premature escape of the aqueous humour, the iris falls forwards under the edge of the knife. If the point of the knife is completely entangled in the iris, it is necessary to withdraw the instrument, heal the wound, and repeat the operation afterwards. If, however, a little bit of it should get under the edge of the knife, when the section is nearly complete, the operator may push on boldly, since if a little piece of it be cut, it will be of no great consequence. 2. If the opening of the cornea is not large enough, it must be enlarged with a small knife. 3. If a portion of the lens remain behind, it should be left to be absorbed—unless it has passed into the anterior chamber, and can be removed very easily indeed. 4. If the vitreous humour seem disposed to escape, the cataract should be hooked out with the curette. But the escape of a little is of no consequence.

After Treatment.—The patient should be put to bed, with the shoulders raised, the room darkened, and with a very soft dry linen rag over both eyes. No food should be allowed which requires mastication, the bowels should be kept open, and everything be avoided which is likely to provoke coughing, sneezing, or vomiting. If he goes on comfortably, the eyelid may be raised on the fifth day, and then if there be no prolapse of the iris, and the cornea be united, he may get up occasionally, wearing a shade, sitting in a darkened room, and walking about a little. After a fortnight the eye may be opened in a weak light, and be gradually brought into use. But inasmuch as it remains weak and irritable, the patient must take the greatest care to avoid exposure to cold, excess in diet, over exertion of the eye, or exposure of it to too strong a light. Gray spectacles are the best protectors against wind, or too glaring a light. The patient will require convex spectacles for exact vision, but they must be used very sparingly at first. He should have two pairs, one with a short focus for near objects, and another of long focus for distant objects.

The inflammation which may come on after the operation may be of two kinds. If the eyelids are swollen, and florid, and tender, and there is a thick yellow secretion about the lids, and the conjunctiva is red, swollen, and chemosed, the inflammation is acute, and requires to be treated by bleeding and purging. But if, as Mr. Tyrrell shows, the palpebræ are not much discoloured, and are rather œdematous than tinged with blood; and if the secretion is light-coloured, and the conjunctiva œdematous, the patient will be benefited by good broth, carbonate of ammonia, and opium.

II. Depression, or Couching.—The object of this operation is to remove the cataract from the axis of vision. It is a clumsy and violent operation, and adapted only to those cases of hard cataract, of which the extraction would be unadvisable, for reasons mentioned in a preceding page. The disadvantages of it are, that the pressure of the lens on the ciliary processes and retina is liable to be followed by protracted inflammation or amaurosis; and that the lens may rise again to its old place, and obstruct vision as before. The preparation of the patient, his position during the operation, as well as that of the surgeon, and the duties of the assistant, are the same as required for the operation of extraction. The pupil should be dilated with belladonna. There are four ways of operating.

Operations. — 1. A couching-needle is passed through the outer side of the sclerotic, the $\frac{1}{10}$th of an inch behind the margin of the cornea, and in the transverse axis of the globe. It is carried upwards and forwards behind the iris, and in front of the cataract, and then is steadily and gently pressed upon it till it has carried it downwards and backwards out of sight. It should be held for a few moments to fix it, then should be lifted up, and if the lens rise also, it must be again depressed for a short time. Then the needle is withdrawn.

2. According to *Scarpa's plan*, a curved needle is used instead of a straight one. It is to be introduced with its convexity forwards, and the lens is to be depressed in the manner just described—but before withdrawing the needle, its point is to be turned forwards, and made to lacerate the capsule freely.

3. *King's Operation.*—A curved needle is passed perpendicularly through the sclerotic, as low down as possible; and if the patient's eye is directed upwards and inwards, it can be made to enter almost perpendicularly below the centre of the cornea, and one-eighth of an inch from its margin. It should then be passed onwards with a slight rotatory motion to the pupil, having its convexity forwards, *i. e.*, towards the back of the iris. When it reaches the pupil, these rotations are to be increased, so that the point may cut the anterior capsule into small pieces. The needle is then slowly withdrawn, and the lens follows it, so that it is left at the bottom of the eye close to the puncture made by the needle. If the lens should not immediately follow the needle downwards, the latter is to be stuck into it again.*

4. The method of *reclination*, which consists of turning the lens backwards from an upright to an horizontal position, is not much in vogue, although some surgeons recline the cataract before they depress it.

III. THE OPERATION FOR PRODUCING ABSORPTION is very easily performed, and excites very little inflammation. It requires to be repeated several times, and the cure occupies several weeks or months. It is well adapted for soft cataracts, especially the congenital, but very seldom if ever answers with the hard cataracts of old people.

Operations.—1. The needle may be introduced behind the iris in the same manner as for depression. Then the anterior layer of the capsule is to be freely divided, and the needle, having been passed once or twice through the substance of the lens, is to be withdrawn.

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* Lond. Med. Gaz. vol. xxii. pp. 701 and 1009.

Care must be taken not to dislocate the lens in this first operation. The cataract will be more or less dissolved by the aqueous humour, and be absorbed. After the lapse of a few weeks, the operation may be repeated, the capsule may be lacerated more extensively, and the lens be cut up into fragments, which, if perfectly *soft*, may be pushed through the pupil into the anterior chamber, where absorption is more brisk. This operation may be repeated again and again if necessary. But if a hard fragment be pushed into the anterior chamber, it may probably excite great inflammation, and require to be removed by operation ; so that the surgeon had better avoid attempting to do too much at once.

2. Or the needle may be introduced through the cornea, an operation styled *keratonyxis*. It is safer than the first mentioned, inasmuch as a wound of the cornea alone is less serious than one implicating vitreous humour, sclerotic, conjunctiva, and perhaps retina or ciliary processes. The pupil must be well dilated. Then the needle is passed through the cornea about an eighth of an inch from its margin, and is made to lacerate the capsule to the extent of the pupil. It should be of such a shape as to prevent the escape of the aqueous humour.

3. There is a third modification of this operation, which Mr. Tyrrell terms the operation by *drilling*. It is particularly adapted for cases of capsular or capsulo-lenticular cataract with adhesion of the pupil, caused by iritis. It is performed by introducing a fine straight needle through the cornea near its margin, and passing it through the pupil to the lens. It is then to be made to enter the substance of the lens to the depth of about one-sixteenth of an inch, and to be freely rotated. This operation may be repeated at intervals of three, four, or five weeks ; and if the puncture be made in a fresh place at each operation, that portion of the capsule which is behind the pupil will become loosened and detached, and the lens absorbed. This operation may also be occasionally resorted to in order to diminish the size of the lens, previously to depression or extraction.

OPERATIONS ON INFANTS.—Congenital cataracts should be operated on early—within four months if possible, lest the eye, which when born blind habitually oscillates from side to side, may never acquire the power of being directed to one particular object. The pupil being well dilated, the child should be placed on a table—the head on a pillow, and rather hanging over it—one assistant holding the legs and trunk, a second the arms and chest, a third fixing the head between his two hands, and a fourth, depressing the *lower* eyelid with one hand, and steadying the chin with the other. The operator then, seated behind the patient, performs the operation for absorption as before described ; at the same time elevates the upper lid, and fixes the globe with an *elevator*. Care must be taken not to dislocate the lens, and not to wound the posterior capsule or vitreous humour. This operation on children, and in fact on persons under twenty, generally excites so little inflammation, that both eyes may be operated on at once; but the bowels must be kept open, and leeches should be applied if there be pain.

CAPSULAR CATARACT.—When congenital cataract is left to itself, the lens becomes absorbed, and the capsule remains tough and opake. And it sometimes happens that an opake capsule is left, or that it becomes opake after one of the operations for cataract. There are three plans of treatment. 1. A needle with cutting edges may be introduced, as for depression; and then may be made to cut crucially through the opake capsule, which then may shrink and leave the pupil clear. 2. The upper part of the capsule, for four-fifths of its circumference, may be detached by the needle from the ciliary processes, and then be pushed down below the pupil. 3. If no other plan succeed in removing a detached piece of capsule, an opening may be made in the cornea, through which it may be extracted by means of a small hook or forceps. Mr. Middlemore has proposed a plan for removing such bodies through the sclerotic.

There is great uncertainty of clearing the pupil of capsule by any other mode but extracting it, yet so dangerous has that operation been deemed, from the escape of the vitreous humour, which is almost sure to occur, when previous operations have been done within the eye, that the extraction is seldom attempted. To meet this difficulty, Mr. Haynes Walton has introduced into practice a peculiar sort of forceps for the removal of the capsule. The instrument is no larger than a needle, so that the opening in the cornea need not be larger than necessary to allow of the exit of the strip of capsule to be removed, and all the objections to extraction are overcome.

SECTION XI.—OF GLAUCOMA.

GLAUCOMA signifies a state of impaired vision, accompanied with a greenish discoloration of the pupil. It was formerly supposed to be dependent on a turbidity of the vitreous humour; dissection, however, has shown that this opinion is not correct; but that the organization of all the central portions of the eye is impaired. The lens is found still transparent, or nearly so, but yellowish or reddish in colour; the vitreous humour yellowish, but nearly pellucid and quite fluid, owing to an atrophy of the hyaloid membrane; the choroid membrane of a light brown colour, from a deficiency of the black pigment; and no remains of the central spot in the retina. The greenish discoloration which appears deep in the eye, is owing partly to the deficiency of black pigment, partly to the change of colour in the lens which reflects the light of a greenish colour, and absorbs the other rays.

Symptoms and Diagnosis.—The patient complains of gradually increasing dimness of sight, attended with more or less rheumatic pain

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[*] Middlemore, Med. Gaz., April 7, 1838; Haynes Walton's Lectures in the Medical Times, 1848—50.

over the eyebrow, and visions of black spots, and flashes of light. The pupil is dilated, and moves sluggishly; the eye feels hard; and its blood-vessels often appear dilated and varicose. The patient is generally from forty to sixty years of age, and the disease appears to partake of the nature of senile degeneration. It may be distinguished from cataract, by the greenish colour, and indistinct nature of the opacity; which resembles, as Mr. Tyrrell observes, the reflection of the sun's rays from a muddy pool, and by its being seen deep in the eye; whereas in cataract, a definite whitish opake body is seen immediately behind the pupil. The opacity disappears, moreover, in glaucoma when looked at sideways, which is not the case in cataract. Vision is assisted by a strong light in glaucoma; but the reverse in cataract. If the eye be examined by means of the reflection of a lighted candle, as was shown in the section on cataract, the inverted image, which is soon obliterated in cataract, is distinctly perceptible in the earlier stages of glaucoma; although not in the later stages; yet it continues to be formed by the circumference of the lens after it is imperceptible at the centre.* The deep erect image, however, continues more distinct even than in the healthy eye; whereas it is absent in cataract.

Treatment.—It is of no use to adopt any other treatment for the ordinary chronic glaucomatous degeneration of age, beyond abstinence from exertion of the eye; and from anything likely to disorder the health. But if the affection begin suddenly with acute symptoms of a gouty character, as it does sometimes, they must be combated by cupping, counter-irritation, and the other remedies proposed for the arthritic iritis.

SECTION XII.—OF THE DISEASES OF THE CHOROID; AND OF SYNCHYSIS AND HYDROPTHALMIA.

I. INFLAMMATION OF THE CHOROID, or CHOROIDITIS, is not a common disease, and is apt to be overlooked in its early stages; Dr. Mackenzie has generally met with it in strumous females.

Symptoms.—It commences with more or less intolerance of light, and dimness of vision, together with pain in the eye, eyebrow and forehead, and lachrymation. The conjunctiva is not uniformly red, but one or more enlarged vessels are seen to proceed from the back of the eye, and to terminate in a vascular zone partially surrounding the cornea. The pupil is often displaced, and brought towards the affected side of the choroid. If it proceed, the sclerotic becomes thin and blue, showing the choroid through it—a watery fluid is effused between the choroid and retina, causing the thinned part of the sclerotic to bulge out (*staphyloma scleroticæ*), and finally the cornea may become opake, the eye protrude from the socket, and the whole globe suppurate. The digestive organs are generally much deranged from the first, and hectic and emaciation come on when the eye becomes much distended and painful.

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* When the candle is held in the axis of the eye, the inverted image is obscure, both in incipient cataract and in incipient glaucoma; but when it is moved to one side, it becomes distinct in glaucoma, but remains obscure in cataract.

Treatment.—If an acute case of the sort should occur in a strong constitution, local bleeding, purgatives, tartar emetic ointment to the nape of the neck, and warm or vapour baths, and mercury may be necessary. But in cases of debility, great caution must be used in regard to depleting measures and mercury; and together with the latter some tonic should be given. Counter-irritation is always of service. When the sclerotic becomes much distended, it may be punctured with a needle—the instrument being introduced for one-eighth of an inch towards the centre of the eye, so as not to wound the lens; this will cause temporary relief.

II. WEAKNESS OF SIGHT; MUSCÆ VOLITANTES. Persons of delicate constitutions and sedentary habits, especially if they are in the habit of writing much, or otherwise exerting their eyes on minute objects, are liable to suffer from dimness of sight; uneasiness on exposure to a strong light; and the vision of floating black specks or streaks, which from their resemblance to flies, have acquired the name of *muscæ volitantes.* These symptoms evidently depend on weakness of organization, either original or produced by over exertion; and the principal measures to be adopted are tonics, aperients, shower-bathing, and change of air, with perfect rest of the eyes, which afterwards should not be used too long at a time. Weakness of sight, with intolerance of light, is very commonly an accompaniment of short sight; it may always be recognised by an uneasy bashful look about the patient's eyes, the lids of which are half-closed, and perpetually winking, and the brow contracted. The muscæ volitantes are supposed to depend on a distension of the vessels of the choroid; if there is a permanent black spot, it probably depends on a permanent varicosity of some branch.

III. SYNCHYSIS is an unnatural fluidity of the vitreous humour, which may or may not be also discoloured. The eye feels soft and flaccid, the iris is peculiarly tremulous, shaking backwards and forwards like a rag in a bottle of water, the retina becomes insensible, and the lens opake. This affection is sometimes the result of wounds, and sometimes comes on without obvious cause. It is supposed to depend on a slow inflammation. It is irremediable. It sometimes follows operations for cataract in which the needle has been too freely used; apparently from the breaking up and absorption of its containing tissue. But although there is this great change of structure, vision may still be wonderfully perfect.

IV. DROPSY of the vitreous humour, or HYDROPHTHALMIA, probably depends on slow inflammation of the inner tissues of the eye. It causes enlargement of the globe, with loss of sight. In some cases there is constant excruciating pain, only to be relieved by puncturing the sclerotic with a needle. In others, there is no pain; the disease advances a certain length, and then becomes stationary; and the only thing complained of besides the loss of vision, is the deformity.

SECTION XIII.—OF RETINITIS.

THE RETINA must of necessity be more or less involved in any inflammatory process which affects the deeper structures of the eyeball; but sometimes it appears to be the original seat of inflammation, of which authors describe three forms; the acute, subacute, and chronic. 1. In the *acute* form the symptoms are—severe, deep-seated and throbbing pain in the eye, extending to the temples and head; vision rapidly impaired, or even altogether lost; frequent sensations of flashes of light, with great fever and delirium. The pupil gradually closes—the iris loses its brilliancy, and the sclerotic is highly vascular and rose-red. If unrelieved, the whole globe may suppurate. 2. *Subacute.*—Dimness of sight, headache or giddiness, flushed countenance and fever, the pupil soon becoming motionless, and the iris turbid. 3. *Chronic.*—Gradually increasing dimness of sight—visions of black spots or flashes of light—irritability of the eye, and intolerance of light—tenderness of the eyeball, and of the parts around; but the patient, though he may shade the eye, does not always shut it. These affections are distinguished by the circumstance that dimness of sight and intolerance of light occur before redness, or any external sign of inflammation. But the practitioner must carefully discern between these symptoms and the intolerance of light or photophobia, which occurs in *Strumous Ophthalmia*, as the treatment for the two complaints should be diametrically opposite. The age of the patient, and the fact that in Strumous Ophthalmia the sufferer has periods of remission, and can usually open the eyes towards evening, will sufficiently mark the difference: besides, in acute *Retinitis*, there is deep-seated pain felt at all times, while in Strumous Ophthalmia the pain is very little felt, so long as light is completely excluded.

Causes.—Exposure to vivid light, flashes of lightning, strong fires, the reflection of the sun from snow, and the like—or habitual exertion of the eye on minute objects, together with neglect of exercise, confinement of the bowels, and over-indulgence in food and spirituous liquors.

Prognosis.—If, in the acute or subacute form, vision is not much impaired, nor the iris altered, nor the pupil much contracted, the prognosis may be favourable.

Treatment.—General and local bleeding, purgatives, mercury administered so as to affect the mouth—belladonna, and the antiphlogistic treatment generally, according to the urgency of the symptoms and the strength of the patient. The eyes should not be closely covered, but the patient should be kept in a darkened apartment, observing at the same time that it is thoroughly ventilated. So soon as the urgent symptoms abate, change of air will be found of great service.

SECTION XIV.—OF AMAUROSIS.

Definition.—Imperfection of vision, depending on some change in the retina, optic nerve, or brain.

Symptoms.—1. Of course the first and most prominent symptom is impairment of vision; the mode and degree of which, are, however, subject to very great variety. Sometimes the sight becomes suddenly dim, and is soon extinguished altogether; more frequently it becomes impaired by slow degrees; and at first is only so at intervals; after the eyes have been fatigued, for instance, or when the spirits are low, or the stomach disordered. Sometimes it commences as indistinct vision, or *amblyopia*,—or as *diplopia*, objects appearing double,—or as *hemiopia*, one half only of the objects looked at being seen; or objects may appear crooked, disfigured, or discoloured; or they may be seen covered with patches; or the affection may commence as near-sightedness or far-sightedness. The patient finds himself unable to estimate distances, and misses his aim when trying to snuff a candle, or pour beer into a glass. The flame of a candle generally appears split, lengthened, or broken into an iridescent halo.

2. *Ocular spectra*, sometimes in the form of floating black spots (*muscæ volitantes*), sometimes as flashes of light, or as a coloured cloud or network.*

3. Sometimes incipient amaurosis is attended with great intolerance of light—sometimes, on the contrary, with a constant *thirst for light*, or feeling as if objects were not illuminated enough.

4. The patient walks with a peculiar uncertain gait, and his eyes have a vacant stare; the eyelids move imperfectly and seldom—the pupil is generally dilated (unless it be an incipient case, attended with intolerance of light); the iris moves sluggishly, and in confirmed cases is totally motionless. But if one eye be sound, and be exposed to light during the examination, the iris of the affected eye will often move in sympathy with that of the sound one.

Diagnosis.—Amaurosis may be distinguished from cataract by noticing, 1. That in cataract, an opake body can be seen behind the pupil, and that the impairment of vision is in proportion to the extent of that opacity; whereas, in pure amaurosis, the pupil either shows its natural colour, or else a deep-seated greenish discoloration. 2. That, in cataract (with the exception of the radiating variety), vision is simply *clouded*, and that a lighted candle appears as if enveloped in a mist; whereas, in amaurosis, objects are seen *dis*coloured or perverted in shape; and that a lighted candle seems split, or lengthened, or iridescent; and that *muscæ volitantes*, and flashes of fire when the eyes are shut, are not present in pure cataract. 3. That in cataract vision is better in a dull light, whereas it is generally the reverse in amaurosis. 4. That a patient with cataract is always able to discern light from darkness, and that he looks about him and moves his eyes as though conscious that vision still exists, although he may be unable to discern particular objects; whereas in confirmed amaurosis there is a peculiar fixed vacant stare, and the eyeball is protruded and motionless. 5. That in pure amaurosis the three images of a candle are as distinct as in the healthy eye, which is not the case in cataract.

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* The Student will do well to read Milton's account of his own blindness, as given in Dr. Johnson's Lives of the Poets.

Prognosis. — This is generally unfavourable — unless the disease depends on some palpable cause which admits of removal, and unless the remedial measures employed very soon produce good effects.

Varieties.—Amaurosis has been divided into the *functional* and *organic:* the former depending on some sympathetic or other disorder which does not primarily affect the structure of the nervous apparatus of the eye—the latter on organic disease.

Causes.—The usual causes of amaurosis are circumstances that over-stimulate and exhaust the retina; such as long-continued exertion of the eye on minute objects; or exposure to glaring light, especially if combined with heat—and these exciting causes are particularly aided by intemperance, stooping, tight neckcloths, too much sleep in bed, and any other circumstances capable of producing determination of blood to the head. Amaurosis may also be a consequence of organic change, inflammation, concussion, compression from extravasated blood, fractured bone, morbid effusions, tumours or aneurisms—whether affecting the brain, optic nerves, or eye.

Treatment.—The indications in every case are, 1. To rectify any palpable disorder—inflammation or plethora by depletion; debility by tonics. 2. To neutralise determination of blood to the eye or head by counter-irritation. 3. To stimulate and restore the excitability of the retina. For practical purposes, it will be convenient to classify the disease under the five following heads, viz. 1. Inflammatory; 2. Atonic; 3. Sympathetic cases; 4. Those produced by poisons; and 5. By organic disease.

1. *Inflammatory.*—(*a.*) If amaurosis be attended with any of the symptoms of retinitis that have been before enumerated;

(*b.*) Or if it suddenly follow some injury to the eye, such as a punctured wound, or blow on the naked eyeball, or exposure to a flash of lightning; or if the patient has been engaged in occupations that necessarily tax the eye severely, such as reading and writing much by candle-light; exposure to the intense light reflected from snow; staring at an eclipse of the sun, and so forth;

(*c.*) Or if there are plethora, headache, giddiness, red turgid countenance, with a hot skin and a hard pulse,—and if there are frequent flashes of light, or streams of red-hot balls seen before the eyes (especially when stooping, or undergoing some active exertion);

(*d.*) Or if the complaint has followed a suppression of any accustomed evacuation, such as bleeding from piles; or the translation of erysipelas or gout ; or the suppression of the menses from exposure to cold ; or the sudden suppression of perspiration ; or the drying up of an habitual ulcer or eruption ; or if it accompanies the inflammatory hydrocephalus that sometimes follows scarlatina ; in all these cases the antiphlogistic treatment must be adopted, and should be pursued with vigour.

Bleeding, or cupping from the temple or mastoid process, should be performed at intervals. The bowels should be well cleared, the diet should be devoid of stimulating substances, and all employment of the affected organ and all violent bodily exertion should be desisted from. Mercury should be administered—rapidly if the case be sudden in its attack, and present urgent inflammatory symptoms—but more slowly if it present a more chronic aspect ; but in either case it should be given so as to bring the system under its influence, and its effect should be kept up for some time. Small doses of tartarized antimony may sometimes be conveniently combined with the mercury (calomel gr. ii. ant. tart. gr. $\frac{1}{6}$,) or may be given according to F. 62, 67, 68. Counter-irritants of all sorts are beneficial ; blisters, or the tartar-emetic ointment applied behind the ears, or to the nape of the neck—immersion of the feet in hot water and mustard—or an issue in the arms in chronic cases.

2. *Atonic* amaurosis may come on at the close of some long and exhausting illness, or may be produced by great loss of blood, menorrhagia, immoderate suckling, leucorrhœa, excessive venery, or other debilitating circumstances. It may be distinguished by its being attended with general debility, pallid lips, frequent trembling pulse, dilated pupils, and despondency of mind ; and the patient generally sees best after a meal or a few glasses of wine, and in a strong light. The practitioner must carefully examine into the causes of debility—whether they consist in some disorder of the system, or in depraved and unhealthy habits of life. The *treatment* consists, first, in suppressing any habitual discharge, or other source of exhaustion. Secondly, in strengthening the system by change of air, tonics, quinine, steel and zinc, and especially by good living. At the same time the abdominal secretions should be well regulated by aperients (such as aloes and rhubarb), that act copiously, but not drastically ; and the cutaneous and general circulation be promoted by exercise and bathing, especially the shower-bath. Camphor, or arnica, F. 190, asafœtida, and other fetid stimulants, or strychnine in very small doses (gr. $\frac{1}{12}$) may be of service. It is in this form, if in any, that local stimulants are applicable—such as exposing the eye to the vapour of æther, or sal volatile (a teaspoonful of either being held in the hand), taking electric sparks from the eye ; stimulating snuff (F. 184), cataplasms of capsicum to the temples ; strychnine applied to the temples after the skin has been denuded by a blister, beginning with gr. $\frac{1}{8}$, and gradually increasing it to gr. i ; one or two drops of a solution of strychnine (gr. ij. ad ℥j aq. destill.) dropped twice daily on the conjunctiva which has been found useful in some cases ; friction of the

forehead with cajeput or croton oil, or with an alcoholic solution of veratria.

3. *Sympathetic.*—(*a*) Amaurosis not unfrequently supervenes on an attack of jaundice. If there be evidence of congestion in the head, as there frequently will be, blood should be taken by cupping, whilst the abdominal disorder should be removed by appropriate measures.

(*b*) If there be headache, vertigo, foul tongue, disagreeable eructations, tumid belly, and other evidence of abdominal congestion and disorder, emetics, repeated once or twice a week, blue pill or hyd. c. creta, in small doses every night ; and purgatives, such as senna, aloes, and rhubarb, with soda, magnesia, and ipecacuanha, till the secretions are set to rights, followed by tonics and counter-irritants, are the requisite measures. In similar cases, some foreign authors recommend the use of Schmucker's or Richter's *resolvent pills*, F. 185. Turpentine or the *kousso* should be given if there be signs of worms.

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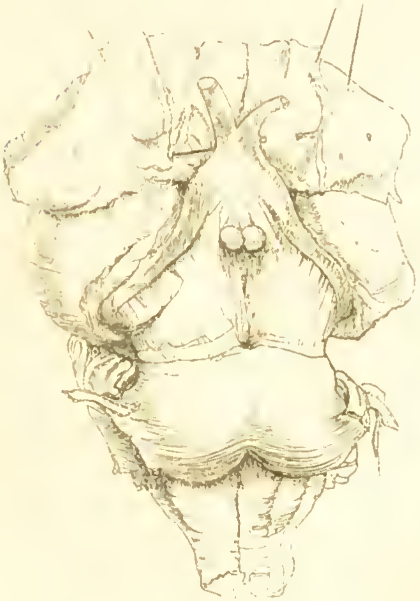

(*c*) Amaurosis sometimes arises from irritation of the fifth pair of nerves. If it follow a wound on the forehead, the latter should be dilated, or if it have healed, the cicatrix should be cut out. Tumours of all sorts near the eye, and carious teeth, should be removed.

4. *From Poisons.*—Amaurosis is liable to be induced by certain narcotico-acrid poisons, such as belladonna, and especially by tobacco, whether administered in poisonously large doses by accident, or used slowly and frequently in the form of snuff or smoke. If the amaurosis persists after the ordinary effects of the poison have been got rid of by the usual measures, the cold shower bath, counter-irritation, electricity, and small doses of mercury are the remedies most likely to be of service. Amaurosis is also one of the set of paralytic affections which lead may induce. The treatment must be conducted on the same principles.

5. *Organic.*—These cases are the most hopeless. If the disease

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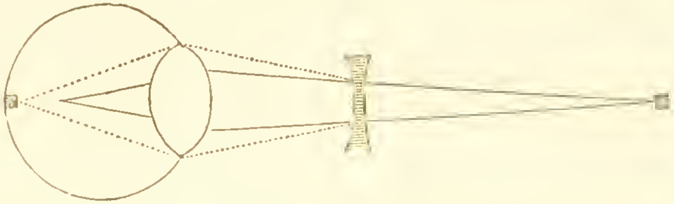
* This cuts exhibits atrophy of the left optic nerve and right tractus opticus consequent on amaurosis.—From the Middlesex Hospital Museum.

has followed an injury of the head, or fit of apoplexy, or syphilis, or if there be reason to suspect a tumour in the brain, or in the course of the optic nerve,—a moderate course of mercury, or of iodide of potassium with alkalis and sarsaparilla, and with counter-irritants, should be tried, and sometimes may effect a cure. Amaurosis arising from a tumour within the brain will usually be accompanied by symptoms that will sufficiently point out the hopeless nature of the disease. There is an interesting case of this kind related by Mr. Browne of Belfast in the "Dublin Journal of Medical Science" for May 1849, in which there was increasing amaurosis, with complete paralysis of the motores oculi nerves; after death a tumour, nearly three drachms in weight, was found in one of the crura cerebri. For other cases of amaurosis arising from organic disease, especially if there be fixed pain in the head, palsy, or epilepsy, or idiocy, the best thing that the surgeon can do will be to prevent congestion in the head by occasional depletion, and counter-irritation; to maintain the secretions of the liver and bowels; to keep up the strength by a nutritious but not stimulating diet, and to guard the patient from every excess or exertion, mental or bodily, that is capable of accelerating the cerebral circulation.

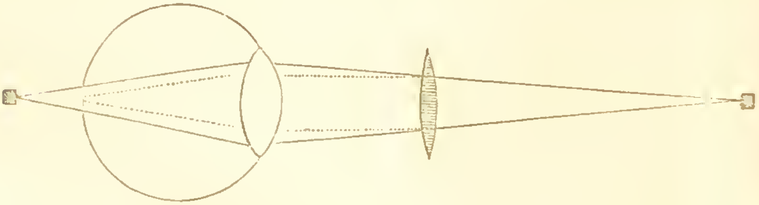
SECTION XV.—OF SHORT AND LONG SIGHT.

I.—SHORT SIGHT or MYOPIA.—This affection appears to depend either on an increase in the refractive power of the eye, or else on an elongation of its axis, so that in either case the rays of light are brought to a focus before they reach the retina. The cornea is generally exceedingly convex, and the secretion of aqueous humour abundant; and the crystalline lens is also probably too convex, all of which circumstances would cause the refractive power of the eye to be increased. It is caused by too close attention to study and by habits of looking at minute objects, as in reading, learning music, and the like; by which the ciliary muscle is brought constantly into play in the adaptation of vision, and thus, probably, the curves both of the cornea and crystalline lens become altered, and their surfaces become sections of smaller spheres than normal; hence the increase in the refractive powers of the eye. It is a popular error to imagine that the sight improves as the individual grows older.

Treatment.—The eyes should be exercised and accustomed to look at distant objects. When children display any tendency to short sight, their studies should be abridged, and they should have plenty of exercise in the open air. Shooting, archery, cricket, and field sports in general, are highly beneficial. It is worth while also to try a plan of treatment invented by Berthold, and consisting in the use of an instrument which has received the sesquipedalian title of *myopodiorthoticon*. This is really nothing more than a support for the chin, to prevent the patient stooping forwards, whilst he reads from a book with large print. And the book is every day to be placed at a slightly greater distance from the eyes, till the patient has acquired the faculty of reading at the ordinary focal distance—that is to say, at about fifteen inches. The glasses which are adapted for shortness of sight are concave; since they tend to disperse the rays of light, and prevent their coming to a focus so soon. They should not on any account be resorted to, however, if the patient can go on pretty comfortably without them; or at all events should only be worn when required to prevent him from stooping awkwardly whilst reading or playing music. But if the myopia is very decided, or if the eyes feel fatigued after any ordinary use of them, it will be better to wear the glasses continually. Spectacles should always be used in preference to a single glass. The patient should choose a pair that enables him to see objects within forty feet as distinctly as other people,—the names on the corners of the street for instance; but should not have them so concave as to make objects appear dazzling, or smaller than usual.



II. Presbyopia, or longsightedness, depends apparently on a diminished quantity and density of the humours of the eyeball, through which it becomes flatter, and its refractive powers are diminished. It needs scarcely be said that it is one of the earliest signs of impaired nutrition in old age. The patient's sight must be remedied by *convex glasses;* and whilst in myopia the patient should abstain from the use of glasses, if at all possible, in presbyopia, on the contrary, glasses should be used immediately that the patient perceives that he cannot read at the usual distance without fatigue to the eye; taking care that the lenses chosen are of the lowest power, that will assist vision and



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* The former of these cuts is intended to explain the nature of myopia, and the effects of concave glasses; which disperse the rays and prevent their coming to a focus before they reach the retina. The latter is intended to show the reverse state of things in presbyopia.

restore the faculty of reading at the distance of from sixteen to twenty inches. The sight should be spared by candle-light as much as possible. The glasses should cause minute objects near the eye to appear bright and distinct, but not larger than natural. If they do, they are too convex.*

SECTION XVI.—OF SQUINTING.

SQUINTING, or STRABISMUS, may be defined to be a want of parallelism in the position and motion of the eyes.

The essential cause of the affection appears, in most instances, to be some weakness of sight, or some want of adjustment in the visual axis of one eye in consequence of which it is involuntarily turned aside, in order to avoid the double or distorted vision that would result from looking at objects with two eyes of different powers. The immediate mechanism by which the squint is produced, is most probably a relaxed or inactive state of the external rectus muscle, so that its antagonist muscle, the internal rectus, preponderates in force, and draws the eye inwards.† Sometimes, although more rarely, it may be supposed that the affection commences by an original spasm of the internal rectus.

The ordinary form of squint is the *convergent*, or that in which the eye is turned inwards; the *divergent*, or that in which the eye is turned outwards, is more rare. It occasionally happens that both eyes squint; but it must be remarked that they do not both squint at the same time, but alternately; occasionally, however, both eyes converge at the same time. When one eye is distorted and *fixed*, the affection is called *luscitas*.

CAUSES.—1. Squinting may be caused by congenital malformation. 2. It may be induced by bad habits; such as the imitation of parents, nurses, or schoolfellows, if they happen to squint; or by constantly looking at spots and pimples on the nose; or it may follow affections (such as hordeolum) which render motion of the eye painful, and during which the patient turns the eye inwards and keeps it motionless. 3. It may be caused by using one eye constantly to the neglect of the other. It may be observed that all shortsighted persons have more or less tendency to squint, for the following reason. They never use both eyes whilst they are reading or examining small objects near the eye; but sometimes use the right eye, and sometimes the left. If, however, they were by accident to persist in using one only, it would become stronger by use, and the other weaker by disuse; and the weaker might squint. In this manner, squinting has been known to occur after one eye has been for a long time shaded in consequence of an inflammatory attack; which shows the expediency of always covering both eyes when a shade is necessary. 4. If there happens to be an opacity on the cornea of one eye, and that eye is the better one, the patient will sometimes continue to use it for ordinary vision, but for that purpose is obliged to distort it so as to remove the corneal opacity from the visual axis. 5. Squinting, like almost every other conceivable consequence of defect of nervous influence, is sometimes a relique of fevers and the exanthemata. 6. It may be induced by irritation or disorder of the stomach and bowels, teething, worms, constipation, and so forth; it may, moreover, be caused by fright or violent fits of passion; and in some children it always appears when the health is out of order, and disappears when it is restored. Lastly, it may be caused by some disorder of the circulation in the brain. Thus it is pretty frequently the precursor of acute hydrocephalus or convulsions in children; and when it is associated with dropping of one or both eyelids, and with unusual sleepiness, or torpor of the intellect, or faltering in the gait, some mischief within the head may fairly be anticipated.

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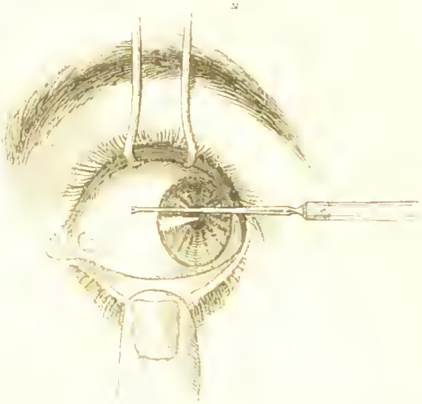
* An elderly gentleman, who had been some time presbyopic, met with a violent fall and contusion of the eyes; which doubtless produced an increased secretion of aqueous humour, and restored his power of seeing at the ordinary focal distance. Presbyopia occurring in young persons generally arises from intestinal irritation, and may be a precursor of amaurosis.

† This is shown by the results of the operation of dividing the internal rectus, after which the eye is merely drawn by the external rectus into its natural position; whereas, when (in various accidents) one of the recti of a sound eye has been severed, its antagonist has drawn it completely over to its own side. Vide Sir C. Bell, Practical Essays, 1841.

Treatment.—If the affection be recent, it may perhaps be removed by judicious medical treatment. The patient should be secluded from the society of every squinting person who might be imitated. Any disorder in the stomach or bowels should be removed by purgatives, antacids, and tonics; and if the patient is a weakly child, and if the squinting has followed a severe illness, a course of steel wine, or small doses of sulphate of zinc, may be of service. An endeavour should be made to strengthen and exercise the squinting eye, by covering the sound one with a light shade for one or two hours every day; but this must be done with moderation, because it has happened, that whilst a squinting eye has been cured by this means, the sound one has been weakened by seclusion, and has been made to squint instead. It is a useful plan to make the patient exercise his eye before a glass in the following manner. He should be told to close the sound eye, and look at a particular point with the squinting one. Then let him open the sound eye. Upon this, the squinting eye will immediately diverge; but by perseverance the patient may educate it, till he can command it, and keep it parallel with the other. If a child is beginning to squint, close application to study should be interdicted; plenty of exercise should be taken in the open air; and if the sight is short, a pair of shallow concave spectacles should be used.

But if the squint is of long standing and is habitual, very little good can be done unless the internal rectus muscle is divided; or the external rectus, if the squint is divergent. This operation will be of equal efficacy, whether the squint is produced by spasm of one muscle, or by weakness of its antagonist. It is easily performed in the following manner. The patient, if an adult, and manageable, sits in a low chair; if an unruly child, he should be rolled up in a sheet, and be placed on a table, with the head supported by a pillow. The sound eye should of course be bandaged, and an assistant should place two fingers on it to keep it steady during the operation. Then the upper lid of the squinting eye being held up by the assistant's finger, or by a wire speculum, and the lower lid being held down by another assistant's finger, desiring the patient to look out or in, as the case may be, the surgeon pinches up a fold of the conjunctiva with the forceps, over the insertion of the rectus muscle to be cut, and then divides it by a touch of the scissors; the incision should be about half an inch long, and in the vertical direction. By repeated light snips with the point of the scissors, the cellular tissue is cut through, and the sclerotica with the tendon exposed. A blunt hook is then passed under the tendon, which should be raised, drawn a little forward, and divided by the *scissors*. When the operation is complete, the surgeon will find that the patient can move the eye more freely than before in all other directions, but that he *cannot move it directly inwards.*



After the operation the eye should be protected from cold and light, and any inflammatory symptoms be checked by appropriate measures. But it is very rarely succeeded by any untoward symptoms, although the author knows more than one case in which the eyeball suppurated and burst.

This operation may be performed for two purposes. The first is, to get rid of the deformity of the squint. And this purpose is generally answered effectually; although it must be confessed that the inner side of the eyeball is sometimes apt to project somewhat, and the eye to look large and goggled. But the patient must make his own choice between this and the squint.

The second purpose is that of strengthening the eye, and enabling the patient to bring it into use. And this purpose is no doubt answered in some measure, so that both eyes are used for the vision of remote objects, and the patient says that the eye feels stronger and clearer; but it is not likely to be useful in near vision till after a long time, if at all. Moreover, after the operation, it is very common for some degree of double vision to be complained of. This will be perfectly intelligible when it is considered that objects are viewed by two eyes of different powers and adjustments. But this inconvenience soon passes off, because the patient learns to neglect the image presented by the weaker eye.

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* The hook represented in the cut, and used for the purpose of steadying the eye, is now never employed.

SECTION XVII.—OF MALIGNANT DISEASES OF THE EYE.

I. Scirrhus.—True scirrhus begins in the conjunctiva, which after years of supposed inflammation, becomes tuberculated, thickened, and red. The eye is exquisitely tender ; there is much burning or lancinating pain, and severe hemicrania. After a time, ulceration occurs, and spreads to the neighbouring parts, and the patient sinks.

Treatment.—Extirpation, if it can be adopted before the lids are affected ; if not, the local and general employment of narcotics.

II. Medullary Sarcoma is not unfrequent, especially in children. Its most frequent seat is the termination of the optic nerve. The eye is accidentally discovered to be blind, and a small tumour of a peculiar metallic lustre can be detected very deep behind the pupil. This gradually advances, and generally appears whitish or yellowish, and lobulated, and more or less streaked with blood-vessels. In a space of time, varying from a few months to two or three years, the cornea bursts before the enlarging tumour, a bleeding fungus protrudes, the cervical glands enlarge, and the patient perishes. There is not usually much pain before the cornea begins to be distended.

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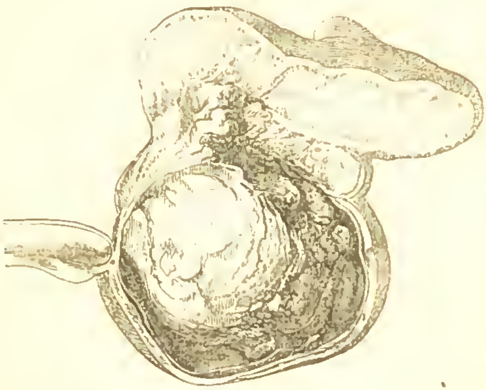

III. Melanosis.—This substance is occasionally deposited in the eyeball, or in the orbit, either alone or in connexion with cancer. There is more to hope for from extirpation of this disease than from that of cancer.[†]

Treatment.—Much may be hoped from a light nutritious diet, fresh air, occasional leechings, and a gentle course of mercury, which should be kept up for some weeks. By these means the disease, if malignant, may be checked; if not malignant, may be cured.[*] Extirpation is scarcely ever deemed advisable in children, 1, because the disease, if really malignant, is sure to return; 2, because there are sundry scrofulous tumours which cannot be distinguished from the malignant, and which either disappear or give no trouble. The diagnosis may be considered doubtful, if such tumours follow an evident wound or injury; if there be scrofulous disease in other parts, and if the eye shrink and become atrophic.

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[*] From a drawing of a preparation in King's College Museum, with which the author was favoured by Mr. Partridge. The eyeball is seen to be filled with a medullary growth.

[†] See a paper by Dr. Robertson, Northern Journal of Medicine, Nov. 1844.

IV. Extirpation of the Eye.—The operator first passes a ligature through the anterior part of the globe in order to steady it, or else seizes it with a hook or vulsellum, and slits up the external commissure of the lids. Then he raises the upper eyelid, cuts through the fold of conjunctiva reflected from it to the eye, and dissects backwards, so as to separate all the soft parts from the roof of the orbit. The same process is repeated below and on the sides—taking care to cut close to the bone, and to remove the lachrymal gland. Then a curved knife is introduced on the inner side to cut through the optic nerve and origin of the muscles, and so the eye is detached. The patient must then be put to bed, with a cloth dipped in cold water laid over the face. If there is very great hæmorrhage from the ophthalmic artery, it may be restrained by pressure with a piece of lint dipped in a strong infusion of matico—which should be removed as soon as it is suppressed; but it is better not to stuff the orbit with lint if it can be avoided.

After staphyloma or any other disease which has rendered the eyeball shrunken and sightless, if the patient objects to the trouble and expense of an artificial eye, it may be convenient to divide the levator palpebræ, in order that the lids may remain permanently closed. This may be effected by making a transverse incision in the upper eyelid just below the orbit, and seizing the belly of the muscle as far back as possible. Then a piece should be snipped out of it with scissors.

V. Encanthis is an enlargement of the caruncula lachrymalis, and semilunar fold of the conjunctiva, which may be easily extirpated by curved scissors. Sometimes, however, it is the seat of a malignant growth, becoming dull red, very hard, and subject to lancinating pain; and finally degenerating into a cancerous ulcer. Sir A. Cooper thinks that in this case extirpation is inadmissible.[†]

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[*] See a clinical lecture by Mr. Lawrence, Med. Gaz. N. S. vol. v. p. 14.

[†] Vide Lectures by Professor Green, in Sir A. Cooper's Lectures, Renshaw's edit.; Lawrence on Diseases and on Venereal Diseases of the Eye; Copland Dict. *Art.* Eye, Amaurosis, &c.; Middlemore on Diseases of the Eye; Guthrie on the Operative Surgery of the Eye; Morgan on the Eye, by France, Lond. 1848; Tyrrell on the Eye, Lond. 1840; and especially Mackenzie on Diseases of the Eye, 3rd edit. Lond. 1840, a work of the greatest erudition and practical utility. Much information and amusement may also be derived from Hull on the Morbid Eye, Lond. 1840, which contains much sterling sense under a vein of pleasantry and affectation of pedantry. See also Mackmurdo's Lectures on Diseases of the Eye, Lancet, 1850; and Mr. Haynes Walton's Lectures in the Medical Times, 1850.

CHAPTER XIII.

OF THE DISEASES AND INJURIES OF THE EAR.

SECTION I.—EXAMINATION OF THE EAR.

I. Deafness is so common and so distressing an infirmity, and when of long standing is so incurable, that we cannot too strongly urge all medical practitioners to make themselves familiar with the treatment of diseases of the ear. They should also encourage their patients to apply to them for the relief of *slight* and *incipient* ailments in this organ, instead of allowing them to go on till they become permanently deaf, and then letting them fruitlessly seek relief from ignorant and mercenary quacks.

II. Examination of the Meatus.—Every surgeon ought to accustom himself to examine the external meatus, and to become familiar with its appearances, both in health and in disease. We may premise that this canal is about an inch long; that its course is forwards and inwards, but that it presents a slight curve with the convexity upwards, and is narrowest about its middle. It may be said to have three divisions, which differ from one another in structure and appearance. In the first or outermost part of the tube, the passage is "formed almost entirely of pure fibro-cartilage covered with its perichondrium," and lined by the same fine dermal structure that invests the auricle.* "Here the skin is studded over with fine white hairs pointing inwards, and also with numerous sebaceous glands or follicles; it is here also more loosely connected to the cartilage than at any other part of the tube, and this accounts for the fact that small circumscribed abscesses occur in this part of the canal more frequently than in any other. The next portion of the tube may be called the *glandular* division, because in it are seated the ceruminous glands that secrete the ear-wax; this is about three-eighths of an inch long, and is the narrowest portion of the tube." Its walls have less of cartilage, and more of dense fibrous membrane in their composition, and its dermal lining is finer. When in a healthy state it is generally coated with wax, which forms a ring, coating this part of the meatus. This part of the passage is, according to Mr. Wilde, the usual seat of polypous excrescences, which probably have their origin in the ceruminous glands. The third and last portion of the passage is slightly dilated, and contained principally within the bony part of the meatus. It can only be seen satisfactorily by means of a speculum, of which instrument several sorts are sold, and some of them intended to dilate the ear. But since it is only the outer extremity of the meatus that can be dilated, these dilators are of no great use, and the most convenient one will probably be found to be a simple conical silver tube of the size and shape depicted in the adjoining cut, and intended solely to transmit *light.*

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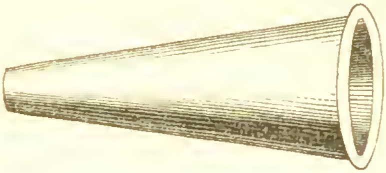
* The quotations are from Mr. Wilde's excellent paper on Otorrhœa, in the Dublin Journ. Med. Sc., Jan. 1844.



For the examination, it is advisable to have a good stream of direct sunshine; but if this cannot be had, the best substitute is a gas or Argand lamp.* The patient, according to his height, should sit, kneel, or stand sideways before the surgeon; who should take the auricle with one hand and gently draw it outwards and backwards, whilst with the other he inserts the speculum as far as it will go without pain. Then, by placing the patient's head at the proper angle, and by gently moving the large end of the speculum from side to side, a stream of light may be made to play on the innermost portion of the meatus, and on the membrana tympani. But the operator must take care not to put his own head in the light.

When the innermost portion of the meatus is thus examined, its lining exhibits, if healthy, a "fine, smooth, dry, pearly white, shining appearance," and in a perfectly healthy state, it is not coated with wax. The *membrana tympani* also is seen closing the passage obliquely; grayish white, dry, and semi-transparent. "Within it, is seen the handle of the malleus, proceeding from above downwards, and slightly forwards." This bone, which runs about half-way across the membrane, divides it into an anterior superior, and posterior inferior portion, the former of which is flat or slightly concave, whilst that part "which is below and behind the malleus is, in a perfectly healthy *living* human ear, convex towards the external aperture. This lower portion is also more glistening in appearance than the upper or anterior part, and when viewed through the speculum, a bright spot of light shines upon its most convex portion, which is a little below and behind the point of the malleus." Under inflammation, this innermost division of the meatus becomes thickened, highly vascular, and villous or granular, like the granular conjunctiva, and secretes a purulent matter; but, according to Mr. Wilde, never gives origin to polypus or fungus.

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* A description of an instrument for examining the ear was published by Dr. Warden, of Edinburgh, in the Edin. Phil. Jour., Oct. 1844. Mr. Avery, of the Charing Cross Hospital, has also constructed an auriscope, with a powerful reflecting lamp.

SECTION II.—AFFECTIONS OF THE EXTERNAL EAR.

I. Foreign substances in the ear. Children not unfrequently poke bits of slate-pencil, peas, glass beads, &c. into the passage of the ear, which, if allowed to remain, would give rise to violent inflammation and deafness. Any such body should therefore be removed as quickly and as gently as possible, either by syringing the ear with warm water, or by means of a small forceps, or a curette or scoop, or bent wire or probe. If it cannot be removed by gentle means, it should be allowed to remain quietly, says Mr. Vincent, when probably it will become coated with wax, and the passage will enlarge by interstitial absorption, so that it will come away without trouble. The surgeon should always make certain, by means of the speculum, that there is a foreign body present before he begins poking instruments into the ear ; remembering that an eminent individual is said to have dragged out the stapes whilst fishing for a small nail which was not there after all.

II. Otorrhœa, or inflammation of the external meatus, with muco-purulent discharge, is a very common complaint in delicate children. Sometimes it occurs after scarlatina or some other fever, and sometimes appears to be excited by currents of cold air, or the irritation of decayed teeth, especially if the stomach and bowels are in an unhealthy condition.

It may occur in connexion with porrigo larvalis, and we may observe, that if the discharge from the ear of an unhealthy child comes in contact with any abraded surface, it is very liable to induce a widely spreading porrigo. It may be caused also by the bursting into the meatus of abscesses which are connected with enlarged glands, or with caries of the temporal bone, as will be mentioned presently.

Symptoms.—This disease begins with fever, headache, intense pain in the ear, and swelling of the glands of the neck. Soon afterwards a reddish serous discharge appears, which gradually becomes thicker and purulent; and as this increases, the febrile symptoms disappear. The discharge, which is often excessively copious, and excessively fetid, unless the strictest attention be paid to cleanliness, is generally tedious in its duration, like most other maladies occurring in scrofulous habits; and if neglected, this disease is liable to produce fungous granulations, ulceration of the membrana tympani, suppuration of the tympanic cavity and of the mastoid cells, loss of the ossicula, and caries of the temporal bone. On examination with the speculum, the whole meatus is seen to be swelled, and vascular, and covered with a slimy secretion.

Treatment.—During the acute stage, the bowels should be opened with a grain or two of calomel, and the diet be restricted to liquids (which, in fact, from the pain caused by mastication, are the only things the patient is inclined for). The affected ear should be very gently syringed out with warm water or poppy decoction, and be constantly covered with a bran poultice (F. 152). If the pain and headache are very severe, leeches may be applied to the mastoid process.

When the pain and fever are removed, and the chronic stage has set in, the treatment must be conducted in the same manner as that of any other chronic mucous inflammation in scrofulous constitutions. The general health must be improved by tonics, alteratives, and aperients; and by warm baths (cold bathing is almost sure to be injurious); and the local disease must be treated by the cautious use of stimulants and astringents. The ear should be twice daily *very gently* syringed out with white soap and water; and immediately afterwards a weak solution of alum or sulphate of zinc (gr. j. ad ℥i.), or a lotion containing two drachms of liq. plumbi diacet. to half a pint of distilled water, may be dropped into the meatus till it is filled, and after remaining there two or three minutes, be allowed to run out. The lotions should be used *tepid*.

The best instrument for syringing the ear in these cases is an elastic bottle; and we may observe, that this operation should always be done as delicately as possible, without hurting the meatus with the nozzle of the pipe, and without forcing in bubbles of air.

If the discharge is very fetid, a lotion of two drachms of solution of chloride of lime to half a pint of water may be used; and if the case is obstinate, the whole interior of the meatus may be pencilled twice a week with a solution of nitrate of silver (gr. v. ad ℥i.), by means of a camel's hair pencil. If the discharge, as sometimes happens, causes excoriation of the auricle or of the neck, these parts must be first fomented, and then smeared with an ointment of hyd. præcip. alb. But it seems advisable not—as a general rule—to insert ointments into the meatus.

If at any time during the treatment, an attack of acute pain and fever should come on, and the discharge should stop suddenly, leeches, purgatives, and fomentations must be resorted to, and all astringent applications be abandoned till these acute symptoms have subsided.

We may observe in this place that the surgeon should be constantly on his guard against the dangerous practice of plugging the meatus with cotton, which many persons do from a belief in its virtues, whilst some lazy parents do it in order to save trouble, and prevent the discharge from soiling the child's clothes. It is never justifiable, however, to put cotton into the *meatus*; but if it be desirable to protect the ear from cold, a little bit may be put loosely into the concha.

III. ACCUMULATIONS OF WAX.—In persons of dark oily complexion, the ear is apt to become completely filled with wax mixed with flakes of cuticle and innumerable hairs. This should be removed from time to time by *gently* syringing with warm soap and water. We may observe that the ear bears water that is rather *hot*; and that a little cotton should be put into the concha after the operation. Syringing the ear, however, is not a thing to be done without consideration, because when the membrana tympani is inflamed, and the passage dry and *devoid of wax*, it can do no good, and may greatly add to the irritation. Before doing it, therefore, the surgeon should ascertain by means of the speculum whether there is any wax really present; and if so, lumps of it and flakes of cuticle may often be removed with forceps, without the possibility of doing mischief. It is scarcely justifiable to poke the ear with probes for the purpose of removing wax.

IV. A THICKENED state of the CUTICLE lining the meatus, is not an uncommon sequel of otorrhœa. The accumulations must be removed by the syringe, and then the surface be touched with a weak solution of nitrate of silver, and afterwards with dilute citrine ointment (F. 168) melted and applied warm with a brush.

V. POLYPUS.—Genuine polypous excrescences, "fleshy pedunculated growths, nearly colourless, having a thin cuticular covering, unattended with pain, not appearing as the result of inflammation, and not accompanied with discharge," Mr. Wilde believes not to be very common; and when they are present, they generally grow from the middle or cerumino-glandular portion of the meatus.

Treatment.—The point of attachment of any such growth having been ascertained, it may be snipped off, if possible, by means of very fine curved scissors, and the place from which it grew should be regularly touched with nitrate of silver, to prevent its reproduction. If it cannot conveniently be excised, it may perhaps be cut off by means of a loop of fine platina wire, carried through a hole in the end of a little silver rod, and slipped over the excrescence.*

VI. FUNGOUS GRANULATIONS are exceedingly common consequences of otorrhœa, and often pass for *polypi*; although, as has just been observed, the genuine polypus is exceedingly rare. They generally occur at the very bottom of the meatus, or grow from the membrana tympani, or from the cavity of the tympanum after the membrane has been perforated by ulceration. Sometimes the membrane is covered with florid vascular granulations so as to resemble the *granular conjunctiva.*

Treatment.—The nitrate of silver should be regularly applied to the diseased surface, and astringent washes should be injected. The nitrate should be applied as before directed only to the diseased part itself, by means of a probe, or some similar contrivance coated with it; and it certainly is not justifiable to thrust a great stick of it, or a great piece of sulphate of copper into the ear, and roll it round, thus cauterizing the healthy as well as the diseased parts, and occasioning intense irritation.

VII. CARIES OF THE TEMPORAL BONE, especially of the mastoid process, may be a consequence of extension of inflammation from the mucous membrane of the ear, particularly if the cavity of the tympanum has suppurated. There is constant *otorrhœa*, and the discharge is sanious and fetid, and stains silver probes. Perhaps the meatus is choked with fungous granulations. This is a most serious disease. Death may be caused by extension of the caries to the cranial cavity, and suppuration on the dura-mater, or by inflammation of the brain or its membranes, through contiguous irritation,—or the side of the face may be palsied through compression of the portio-dura. Sometimes an abscess bursts behind the ear, or burrows amongst the muscles of the neck and points low down.

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* For a description of a very neat instrument of this kind, refer to Mr. Wilde's paper in the Dublin Journal, Jan. 1844. The lunar caustic should be applied by means of a probe, the blunt end of which should be dipped in nitrate of silver that has been melted in a platinum spoon over a spirit lamp, and is just beginning to cool.

Treatment.—Tonics, alteratives, counter-irritants, and astringent injections (or F. 119), frequently repeated, to wash away the fetid discharge. Any portions of loose bone should be cautiously extracted. Sir P. Crampton drew from the meatus of a young lady, a piece of bone comprising the entire internal ear—vestibule, cochlea, and semicircular canals, with a small portion of the inner wall of the tympanum. The patient had urgent symptoms of inflammation of the brain, with hemiplegia, and total deafness of one ear, but ultimately recovered. Abscesses near the ear should be opened as soon as possible. If the patient be labouring under secondary venereal symptoms, sarsaparilla and iodide of potassium may be given with advantage. If inflammation, or symptoms of compression of the brain supervene, they must be treated as was detailed in Chapter X., recollecting that depletion and mercury must be used with the greatest moderation, as they cannot remove the exciting cause.

VIII. EARACHE—(*otalgia*). This term ought to be restricted to signify *neuralgia* of the ear. Genuine *neuralgia* of the ear,—occurring in fits of excruciating pain, shooting over the head and face,—may be distinguished from *otitis* by the sudden intensity of the pain,—which is not throbbing,—does not increase in severity,—is not attended with fever,—and comes and goes capriciously. Its *causes* are the same as those of neuralgia generally, but particularly caries of the teeth; and its *treatment* principally consists in removing carious teeth, or stopping them, and giving purgatives followed by quinine and afterwards iron. What is popularly called earache is an inflammatory pain,—perhaps the precursor of otorrhœa,—to be treated by fomentations and purgatives. Carious teeth, if any, should be extracted, and gum boils be opened.

IX. HYPERTROPHY OF THE EXTERNAL EAR.—Dr. Graves mentions a case in which the pendant lobes of the ears became thickened and elongated through a deposit of fat into their cellular tissue; in a patient who died of fatty degeneration of the liver. The author has seen one or two cases in which the whole external ear was excessively enlarged and thickened; but he would not have included them in this chapter, had not Dr. Graves appeared to consider the affection an uncommon one.*

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* Graves's Clinical Medicine, p. 581.

SECTION III.—OF AFFECTIONS OF THE TYMPANUM AND INTERNAL EAR, AND OF THE CAUSES OF DEAFNESS.

I. ACUTE INFLAMMATION of the membrana tympani* and tympanal cavity may be caused by cold, by sea-bathing, or by mechanical injury.

Symptoms.—Sudden and intense pain in the ear ; often so excruciating as to produce delirium ; increased by coughing, sneezing, or swallowing; and generally coming on first at night, and always worse at night ; feeling of fulness in the ear ; tenderness and soreness in its vicinity ; *tinnitus aurium*, that is, unnatural noises of various sorts, heard by the patient ; *deafness*, partial or complete (except that in some rare cases there is morbid sensibility to sound), and violent fever. On examination during the first stage the meatus is found more or less red, swelled and tender, and dry ; the membrana tympani, dull, opake, and vascular. If the disease goes on from bad to worse, the mastoid cells, petrous bone and dura-mater may be involved, and death result from suppuration on the brain or cerebellum. In other cases suppuration may occur in the tympanum, and ulceration or sloughing of the membrane, which gives great relief by permitting the escape of matter pent up in the cavity ; or in others of less severity, the membrane may be left thickened and opake, from infiltration with lymph, and with adhesions blocking up the tympanum ; or it may ulcerate and suppurate, and give rise to protracted otorrhœa.

Treatment.—Leeches repeatedly applied with a leech-glass around and within the meatus, and before and behind the auricle ; fomentations, poultices, and steam-bath; purgatives ; mercury, so as to affect the system gently ; subsequently blisters behind the ear, and to the nape, and iodide of potassium. F. 94, 95, &c., or F. 63, 87. Should the acute symptoms be unmitigated by ordinary measures, and especially if there is fulness or tumefaction, or obscure sense of fluctuation over the mastoid process, Mr. Wilde recommends an incision, an inch long, to be made with a stout scalpel through the periosteum, down to the bone. It is most generally required parallel to and an inch from the attachment of the auricle.

II. CHRONIC INFLAMMATION.—The researches of Mr. Toynbee have shown most conclusively, that by far the majority of cases of deafness depend on changes wrought in the tympanic cavity by chronic inflammation. Mr. Toynbee divides the diseased appearances in the tympanic cavity into three stages. In the *first* stage, the lining membrane retains its natural delicacy of structure, but its vessels are enlarged and tortuous ; blood is sometimes effused into its substance, or on its attached surface, or sometimes between it and the membrane of the fenestra rotunda ; and sometimes lymph is effused on its free surface. In the *second* stage, the membrane is thickened and flocculent; and occasionally covered with cheesy, tuberculous, or fibro-calcareous concretions; but the morbid change most frequently observed consists of fibrous bands, which are sometimes numerous enough to occupy nearly the whole of the cavity. In some instances they connect the inner surface of the membrana tympani to the inner wall of the tympanic cavity; or to the incus and stapes; but by far most frequently they extend from the crura of the stapes to the adjoining wall of the tympanum, so that this bone is, as it were, completely enveloped in a fog of adhesions. In the *third* stage, the membrana tympani is ulcerated; the ossicles discharged, and the whole middle ear disorganized.*

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* *Myringitis* of Wilde. Vide Contributions to Aural Surgery, by W. R. Wilde, from Dub. Journ. Med. Sc., No. ix.

Causes.—This diseased state may be caused by any of the circumstances that either predispose to, or actually produce, congestion and inflammation of mucous membranes. Thus it is a very frequent sequel of the exanthemata, and especially of scarlatina; it may, like cachectic diseases of the eye, be caused by unwholesome diet, and residence in close unventilated apartments; it may further be the result of local irritation, such as inflammations in the throat, currents of cold air, or previous disease, or improper surgical applications to the meatus. Besides these, there are two sources of deafness which are so common, that they ought to be especially noticed. One is cold-bathing; and the other, the habit of blowing the nose violently, which often causes a most painful strain on all parts in the middle ear, and sometimes bursts the membrana tympani.

Symptoms.—These unfortunately are generally so slight, that the patient gives no heed to them, till in process of time he finds himself altogether deaf in one or both ears. A slight *woolly* sensation, or occasional noises or ringing, with variable obtuseness of hearing, and slight aching, are the most frequent.

Treatment.—Mr. Toynbee's researches show that very few cases of deafness can be considered as *nervous*, since by far the majority depend on a thickened condition of the tympanic membrane; and that, therefore, instead of empirically resorting to stimulants, the most rational plan is to use those local and constitutional remedies which are known to give relief in other cases of chronic inflammation. Pure air, exercise, warm-bathing, regular diet, remedies calculated to improve the general health and the condition of the digestive organs, should always be used. The medicine most likely to be of service, is *mercury*, given in very small doses for a long period; such as F. 86, 87, 63, &c. Any diseased state of the meatus should be remedied by the measures spoken of in the preceding section. If there is any uneasiness about the ear, from two to four leeches should be applied repeatedly to the mastoid process; and afterwards a succession of blisters, each the size of a shilling, or the tartar emetic ointment. If the membrana tympani looks opake, it may be brushed once a week with a solution of nitrate of silver. In fact, the remedies for deafness must be the same in kind as would be used for a granular conjunctiva, or opacity of the cornea, only varied and adapted as the ingenuity of the surgeon may suggest. By such means, if the case is of no very long standing, it will probably be relieved, and may possibly be cured; but it must be confessed that there is not much to be hoped for if the case has been of long duration. Mr. Wilde has found that the *arnica montana*, F. 190, is a good remedy for tinnitus after active inflammation has been subdued.

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* As a proof of the small number of persons whose hearing is quite perfect, Mr. Toynbee found in 120 dissections, 29 healthy; 20 in the first stage of tympanic disease; 65 in the second stage, and 6 in the third stage. Mr. Toynbee has since (October 1846) dissected nearly 1000 ears. The author has to thank him for much valuable information.

III. Deafness is sometimes connected with a *morbid state of the throat and Eustachian tubes;* such as obstruction of the tubes by the enlarged tonsils of scrofulous subjects, or by the cicatrices following the ulcerated sore throat of syphilis or scarlatina; or by thick mucus, or by granulations. Sometimes these tubes are extremely dilated. They may be known to be pervious if the shock of air can be heard against the membrana tympani, by means of the stethoscope applied to the mastoid process, whilst the patient closes his mouth and nostrils, and makes a strong expiration; and they may be known to be clogged with mucus, when loud crackling or gurgling noises are heard by the patient (or by the surgeon with the stethoscope), when he expires strongly with the mouth and nose closed. If the membrana tympani is perforated, air may often be made to whistle through the aperture, and may be seen to escape with bubbles of mucus if the membrane be examined through the speculum whilst the patient is driving his breath through the Eustachian tubes.

Treatment.—Chronic sore throat, or swelling of the tonsils, must be removed by stimulating and astringent gargles, or by swabbing the throat with a sponge dipped into a solution of nitrate of silver, as well as by the use of cod liver oil, bark, with iodide of potassium, mercurial alteratives, counter-irritants, and attention to the general health. In other respects the treatment should be the same as is detailed in the preceding paragraph. These are the cases in which it has been recommended to introduce catheters and bougies into the Eustachian tubes, and to inject warm water, or air, or medicated liquids or vapours into the cavity of the tympanum. But the author cannot recommend these operations for general adoption; first, because they are painful, and because he believes they very seldom, if ever, do any real good; and secondly, because they are dangerous, and have proved fatal in more instances than one. When it is considered that in some cases the bony partition between the Eustachian tube and the carotid canal is almost entirely absorbed; and that in others there is but the thinnest shell of bone, or perhaps only a mere membrane between the tympanic cavity, or mastoid cells, and the cavity of the cranium, or jugular fossa, (all of which morbid changes the author has seen in Mr. Toynbee's collection), it will be very readily understood how the pokings in the dark at the Eustachian tube, and forcible injections of the tympanum that we read of, may have very easily produced fatal results. Possibly the reason why more mischief has not been done, is that the catheter has been poked somewhere, but not into the Eustachian tube. Perforation of the membrana tympani, which has been proposed to be done, so as to allow the access of air to the tympanum when the natural openings in the throat are obliterated, is another operation of very doubtful utility.

IV. Deafness may be caused by *blows on the head*, which either produce concussion or rupture of the auditory nerve, or else extravasation of blood into the tympanum or labyrinth. Depletion, if any inflammatory symptoms are present, with alteratives and counter-irritants afterwards, are the only remedies ; but if deafness immediately succeed the injury, they will scarcely relieve it.

V. It may be produced by *organic alterations in the brain*, tumours, or the like, and may be attended with epilepsy or idiocy, or may be a consequence of apoplexy or convulsions. The *treatment* must be the same as for amaurosis arising from similar causes (p. 393).

VI. DEAFNESS with *perforation of the membrana tympani*, from ulceration. It has been shown by Mr. Yearsley, that this form of deafness is greatly relieved by passing down, night and morning, a little bit of wet cotton wool, so as to stop the aperture, and act as a substitute for the lost membrane.*

VII. Deafness is said to be *nervous*, when it depends on general torpor and debility, and is better at some times than at others, especially in fine weather, and when the patient is cheerful or excited, and the stomach in good order, and when there is an entire absence of all symptoms or vestiges of inflammation. But such a form of deafness is rare ; and Mr. Toynbee has shown, that even in very old persons, in whom it is often supposed to be common, the usual cause of deafness is not defect in the nervous apparatus, but thickening, adhesions, and other effects of inflammation of the tympanal cavity.

Treatment.—Aperients, with diffusible stimulants, especially ammonia, arnica, and valerian; stimulating gargles, *masticatories* of pellitory, &c. If the meatus is dry, and altogether deficient in cerumen, great benefit may be derived from the introduction of a few drops of fish-oil, or of ox-gall, or the vapour of æther or of sp. am. ar. into the meatus, and the application of garlic, mustard, and other counter-irritants behind the ear. *Electricity* may be mischievous.†

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* Vide Lancet for 1848, vol. ii. p. 10, 64, &c.

† Vide Copland Dict. *Art.* Ear and Hearing; Kramer on Diseases of the Ear, translated by Bennet; Pilcher on the Structure and Diseases of the Ear, Lond. 1838; Essay on the Ear, by Joseph Williams, M.D. Lond. 1840; a paper by Mr. Toynbee in Med. Chir. Trans. vol. xxiv.; Med. Gaz. 7th July, 1843; and on Senile Deafness, Edin. Monthly Journal of Med. Sc., Feb. 1849. Instruments for giving tension to the external auricle, are seldom of much service, though puffed as if miraculous; some of the best the Author has seen are the Conques Acoustiques, made by Déon, Rue de la Paix, No. 4 *bis*, Paris.

CHAPTER XIV.

OF THE DISEASES AND INJURIES OF THE FACE AND NOSE.

SECTION I.—AFFECTIONS OF THE OUTER PARTS OF THE FACE, NOSE, AND LIPS.

I. SALIVARY FISTULA is said to exist when the *stenonian* duct has been perforated by a wound or ulcer, so that the saliva dribbles out on the cheek.

Treatment.—In the first place, a good passage must be established from the duct into the mouth. This may be done by puncturing the mouth through the fistula in two places, passing a small skein of silk, or, still better, a piece of very flexible wire, through the apertures, and securing the two ends in the mouth by a knot. After a few days the edges of the fistula must be pared, and be brought into contact by sutures, in order that they may unite by adhesion. When there has been a loss of substance, it may be necessary to apply the actual cautery to the margin of the aperture, in order that the fungous granulations succeeding the burn may supply the deficiency ; or to cover it with a flap of skin raised from the adjoining parts.

II. HYPERTROPHY.—The nose sometimes becomes prodigiously enlarged through an hypertrophy of the cellular tissue and skin, especially in persons who have been addicted to the pleasures of the table. Such tumours are very inconvenient and unsightly, but not malignant. They grow slowly—are indolent and painless—the sebaceous follicles are much enlarged, and secrete profusely, and the skin is more or less mottled with veins.

Treatment.—*If the patient desires it*, the tumour may be removed with the knife ; but he must observe rigid abstemiousness, and have his bowels well cleared for a fortnight previously. An incision may be made in the median line nearly down to the cartilage. Then an assistant distends the nostrils with his fore-finger, whilst the surgeon seizes the morbid growth, and shaves it clean off, close to the cartilage. After the operation, there will be considerable hæmorrhage from numerous vessels. Some of these may be tied, some may be pinched with a forceps, some may be secured with a very fine cambric needle and thread; and any general oozing may be restrained by the application of a cloth dipped in cold water, or, if it be obstinate, by plugging the nostrils, and making pressure with strips of plaster.

III. RHINO-PLASTIC, or TALIACOTIAN OPERATIONS.—When a portion or the whole of the nose has been destroyed by disease or accident, the deficiency may be restored by a transplantation of skin from an adjoining part, the operation being varied according to the extent of the deformity.

1. When the *whole or greater part of the nose* has perished, a tri-

angular piece of leather should be cut into the shape which the nose formerly presented, and be spread out flat on the forehead, with its base uppermost, and its boundaries should be marked out on the skin with ink. Then the remains of the old nose (if any) are to be pared, and the margins of the nasal aperture are to be cut into deep narrow grooves. When the bleeding from these wounds has ceased, the flap of skin marked out on the forehead is to be dissected up, and all the cellular tissue down to the periosteum with it, so that it may hang attached, merely by a narrow strip of skin between the eyebrows. When all bleeding has ceased, the flap is to be twisted on itself, and its edges are to be fitted into the grooves made for their reception, and to be fastened with sutures. The nose thus made is to be supported, but not stuffed, with oiled lint; it should be wrapped in flannel to support its temperature, and if it become black and turgid, owing to a deficiency in the return of blood from it, a leech may be applied. When adhesion has thoroughly taken place, the twisted strip of skin, by which its connexion with the forehead was maintained, may be cut through, or a little strip may be cut out of it, so that it may be laid down smoothly.

2. The *septum* or *columna nasi* is often restored by the same operation with the nose itself, by means of a flap from the forehead; but it is better, as Mr. Liston proposes, to form it out of the upper lip at a subsequent operation. A strip is cut out of the centre of the upper lip, a quarter of an inch in breadth, and of its whole thickness. The frænulum having been divided, this strip is turned up, but not twisted; and its labial surface having been pared off, and the inside of the apex having been made raw, the two latter surfaces are united by the twisted suture, and the wound of the lip is also united by the same. During the cure, the nostrils must be kept of their proper size by introducing silver tubes occasionally.

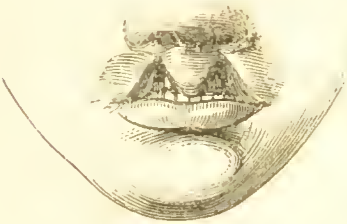
3. When *one ala nasi alone* is destroyed, a portion of integument may be measured out on the cheek, and be raised to supply the deficiency. But if both alæ are lost, or if the cheek be spare and thin, it is better to supply their place with skin brought from the forehead. The slip which connects the engrafted portion with the forehead will of course be long and thin; and in order to maintain its vitality, a groove may be made to receive it on the dorsum of the nose. But when union has occurred, this connecting slip may be raised and cut off, and the groove which contained it be united by sutures.

4. *Depression of the apex* of the nose is to be remedied by raising the parts, dividing any adhesions that may have formed, making, if necessary, a new *columna*, in the manner described above, and supporting the parts carefully with plugs of lint, till they have acquired firmness. But it may be done still more completely by a method which was proposed by Dieffenbach, and a modification of which has been practised with great success by Mr. W. Fergusson. "The point of a small scalpel," says Mr. Fergusson, "was introduced under the

apex, and the alæ were separated from the parts underneath; next the knife was carried on each side between the skin and the bones, as far as the infraorbital foramen, taking care not to interfere with the nerves, when by passing the point of my finger below the nose, I caused the latter organ to be as prominent as could be wished. I now passed a couple of long silver needles, which had been prepared for the purpose, with round heads and steel points, across from one cheek to the other, having previously applied on each side a small piece of sole leather, perforated with holes at a proper distance; then I cut off the steel points, and with tweezers so twisted the end of each needle, as to cause the cheeks to come close to each other, and thus to render the nose prominent. Thus by bringing the cheeks more into the mesial line, a new foundation, as it were, was given to the organ. Adhesion occurred in some places, granulations in others, in the lapse of ten days the needles were withdrawn, and in the course of a few weeks, when cicatrization was complete, the nose presented as favourable an appearance as could reasonably have been desired."*

5. *Depression of the ridge*, owing to the loss of the ossa nasi, may be remedied by paring the surface, and covering it with a flap of skin from the forehead; or by making a longitudinal incision, and engrafting a small portion of skin from the forehead into it; or, if the case is slight, by cutting out one or two *transverse* slips, and bringing the cut edges together by sutures, so that thus the surface may be stretched to its proper level.

IV. Hare-Lip signifies a congenital fissure of the upper lip. Its usual place is just on one side of the mesial line; and it may exist on one side only, or there may be a double fissure with a small flap of skin between. Sometimes there is also a fissure in the bony palate, sometimes in the soft palate also; and sometimes the upper incisor teeth and their alveoli project through the fissure; all which conditions give rise to considerable deformity and impediment in speaking and feeding.



Treatment.—The edges of the fissure, which are red like the lip, are to be pared, and then made to unite by adhesion. Sir A. Cooper recommended that the operation should not be undertaken till the child is about two years old, and has cut its teeth; because of the liability of young infants to be carried off by diarrhœa or convulsions; Mr. Fergusson believes this risk to be exaggerated, and prefers operating shortly after the child has ceased to suck; provided, however, it is in good health, and not suffering from its teeth at the time. But if the deformity is very great, so that the child cannot suck, and the mother desires to nurse it, the operation may be performed a day or two after birth. Infants have been known to die of it (just as little Jews die sometimes after circumcision), but such an event is rare. If the patient is a child, his body should be entirely wrapped in a cloth, to prevent struggles; and the surgeon sits behind him, taking the head between his knees. Then seizing the lip by the corner of the fissure with his left forefinger and thumb, he pierces it with a bistoury at the top of the fissure just under the nose, and carries the instrument downwards, so as to shave off the edge of the fissure, and the rounded corner at the bottom; and it is better to remove too much than too little. This process is repeated on the other side, and the two strips are next detached from the upper angle. When bleeding is checked, the edges are to be brought into most exact union, and to be transfixed by two or more hare-lip pins, or long slender needles; over which a twisted suture is to be made. The first pin should be inserted near the angles of the fissure; and if the labial artery bleed, another should be placed so as to transfix and compress it. The pins should penetrate full two-thirds of the thickness of the lip. They may be removed on the fourth or fifth day; and a slip of adhesive plaster may be drawn from one cheek to the other instead.

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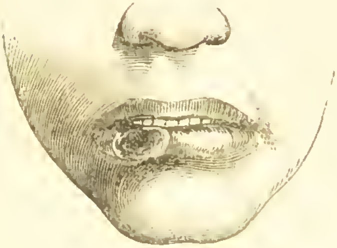
* Op. cit. p. 454.

If the hare-lip is double, both sides may be operated on at once, the middle flap being transfixed by the pins. But care should be taken to push up the middle flap towards the nose so as to render the latter organ more prominent, as it is in general very flat in cases of hare-lip.

If one or more teeth project in the fissure, so as to offer any impediment to its union, they should be extracted; and if the bone project much, it may be necessary to remove a small portion of it with the cutting pliers, the soft parts on it having been first divided with the knife; but sometimes (as in a case related in Cooper's Dictionary) the projecting bones may be pushed so far backwards by means of a kind of spring truss worn daily for several hours, that the soft parts may be brought over them without difficulty; and when this can be done it is far better not to sacrifice any of the teeth. Or, if the patient is a very young infant, it is a good plan just to cut through the projecting bone (as recommended by Gensoul) so as to bend it back, to a proper level. In its cartilaginous condition this can easily be done, and then the lip may be made to meet over it, without straining.

V. Cancer of the Lip commences most frequently as a small fissure (usually attributed to the irritation of smoking), which gradually degenerates into a foul ulcer, with hardened base and ragged surface.

Treatment.—The disease must be extirpated by a V incision—taking care to include the whole of it—and uniting the wound afterwards like that made in the operation for hare-lip. If, however, the whole or greater part of the lip be implicated, the diseased parts should be freely removed without any attempt to unite the edges of the incision. The extirpation cannot be expected to be effectual unless performed before the glands are implicated—but it is justifiable at any stage—in order to avoid for a time the horrible pain and fetor of the ulcerative process. It has been very clearly shown by Mr. Earle, that any ulcers, if subjected to perpetual irritation, (and especially ulcers near the outlets of the body,) may assume a malignant appearance, which ceases on the removal of the source of irritation. When therefore there are foul ulcers on the lips, cheeks, or tongue, the teeth should be well examined in order to remove any roughness, or collection of tartar, and the secretions of the skin, bowels, and kidneys should be carefully attended to.



VI. Cancrum Oris—(*Phagedæna oris, gangrenous erosion of the cheek*) is a phagedæno-gangrenous affection of the lips and cheeks, occurring almost exclusively amongst the ill-fed squalid children of large towns. It appears to be a disease of debility, and to be induced by want of proper food and of fresh air, and by neglect of cleanliness. Like other disorders of a similar character, it is very liable to follow the measles or scarlatina, or any other severe and weakening illness.

Symptoms.—In the instances which have fallen under the author's observation, it has commenced as a shallow ulcer on the lip, or inside of the cheek; with a peculiar dirty gray or ash-coloured surface, and black edges. Sometimes it is said to commence with an exudation of a pale yellow fibrinous matter, like that which is exuded in croup and some forms of putrid sore throat. At the same time the face is swollen, the breath exceedingly fetid, and there is a dribbling of fetid saliva mixed with blood. If the disease proceeds, the ulcer becomes gangrenous, and destroys the cheek and gums; the teeth drop out, typhoid symptoms supervene, and the patient dies exhausted. The swelling which accompanies this disease, shows nothing like active or healthy inflammation. It is moderately firm, or what may be called semi-œdematous, and is either pale, or else of faint pink colour. In the most rapid form of the disease, it commences at once as a black spot of gangrene, which slowly spreads, and is not accompanied by any inflammation whatever; all the parts around being quite pale and wax-like. The constitutional symptoms are at first those of weakness, and disorder of the stomach and bowels, and afterwards the rapid feeble pulse, and stupor of typhus.

Diagnosis.—The diagnosis of this affection is of some importance, because when a child has died of it, the parents, through ignorance or malice, are liable to bring the surgeon into trouble, by accusing him of having caused death through profuse mercurial salivation. The chief points of distinction are, that in this disease the ulceration or gangrene is *circumscribed*, and is generally confined to one side; and that it commences usually in the cheek, and that it only affects that part of the gums which is in close contiguity, and that the tongue is untouched. Whereas in severe mercurial salivation, the ulceration is diffused; the whole of the gums, and the lining membrane of the cheeks, and the tongue, as well as the palate, being affected from the first.

Treatment.—The indications are threefold. 1st. To evacuate and correct the secretions of the stomach and bowels by calomel followed by rhubarb and magnesia. 2ndly. To keep up the strength by wine, beef-tea, and other nutritious articles, and by bark or quinine in sufficient doses. The *chlorate of potassa* has been strongly recommended, and may be given in doses of gr. xx.—xl. in the twenty-four hours. 3rd. To excite a healthy action in the diseased part by stimulating lotions, especially solution of nitrate of silver, alum, sulphate of copper, or the chloride of lime; and, lastly, if these means fail to arrest the disease, the strong nitric acid should be applied so as to destroy the whole of the diseased part, in the same manner as was directed for hospital gangrene.*

SECTION II.—AFFECTIONS OF THE NASAL CAVITIES.

I. FOREIGN BODIES may be removed from the nose by a small curette, or scoop, or bent probe. If they cannot be brought through the nostrils, they may be pushed back into the throat. The removal should be effected as early as possible.

II. EPISTAXIS, or *hæmorrhage from the nose*, may, like other hæmorrhages, be produced, 1st, by injury; 2ndly, it may be an *active* hæmorrhage of arterial blood caused by general excitement and plethora, or by determination of blood to the head, or by the suppression of some other discharge; 3rdly, it may be a passive draining of venous blood, owing to obstruction of the circulation by disease of the heart or liver, or to a morbidly thin state of the blood, together with relaxation of the vessels, as happens in scurvy, purpura, and the last stage of fevers.

Treatment.—1. If the patient be red-faced, plethoric, and subject to headache and giddiness, the hæmorrhage should be regarded as salutary, and should not be restrained too suddenly. If it be very profuse, and attended with much headache, venesection may be performed, and at all events purgatives and low diet should be prescribed. Epsom salts in small doses, with the dilute sulphuric acid, form an useful medicine. 2. But the hæmorrhage requires to be stopped, either if it have continued so long that the patient will be injuriously weakened,—or if it arise from injury,—or if it be a *passive* hæmorrhage depending on visceral disease or general cachexy. If an upright posture, cold applied to the head, and a piece of cold metal to the back, with a draught of any cold liquid, and compression of the nostril do not stop it, the patient may snuff up powdered gum, or gall-nuts, or powdered *matico;* and, these failing, the nostril must be gently plugged with lint. In very urgent cases, the posterior orifice of the nostril must be plugged also. This is easily done by passing a bougie, with a long piece of silk fastened to its end, through the nostril into the pharynx. The end of the silk in the pharynx is then brought through the mouth with a pair of forceps, and a piece of soft sponge, less than an inch in diameter, is tied to it. Then by pulling the silk back through the nose, the sponge is drawn into the posterior opening of the nostril. The plugs or coagula, in severe cases, should not be disturbed for three days. Nitre, and other salines; or pills of plumbi acet., with draughts containing vinegar, F. 75, may be given with advantage in inflammatory cases; and the sulphuric or gallic acids, iron, alum, quinine, small doses of turpentine (♏ xv.), and the ergot of rye, in those of atony and debility.

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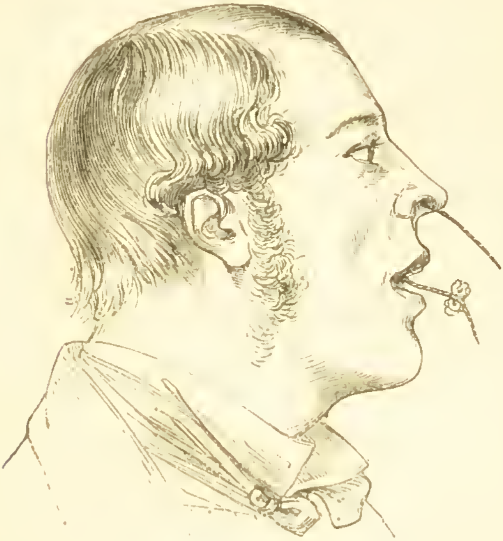
* Vide James on Inflammation, p. 527; Marshall Hall in Lancet for 1839-40, p. 409; P. H. Green, ibid.; and also in Cycl. Pract. Surg. *Art.* Cancrum Oris; Willis on Cutaneous Disease; Hunt, Med. Chir. Trans. vol. xxvi.



III. Nasal Polypus.—There are four varieties of this affection. 1. The common *gelatinous* polypus is a tumour of the consistence of jelly, pear-shaped, yellowish, slightly streaked with blood-vessels, attached by a narrow neck to the mucous membrane, especially that on the turbinated bones, and apparently consisting of organized lymph. The patient has a constant feeling of *stuffing* and cold in the head, which is increased in damp weather. If he force his breath strongly through the affected nostril, whilst he closes the other, the polypus may be brought into view. There are very often more than one of these tumours, and they are very liable to return when removed. If polypus be permitted to remain, it continually increases in size, blocks up the nostril, displaces the septum, and obstructs the other nostril, causes prodigious deformity of the cheek, prevents the passage of the tears, and may even cause death by pressure on the brain.

Treatment.—A probe should be introduced to feel for the neck of the polypus, which should then be seized with forceps, and be gently twisted off. If, as sometimes happens, it projects backwards into the pharynx, it must be extracted through the mouth with curved forceps. After the operation, the nostril should be plugged to restrain bleeding.

2. The *hydatid polypus* is a rare species, consisting of a number of thin vesicles filled with a watery fluid, and attached by a peduncle. The vesicles burst upon the slightest pressure, and their reproduction may be prevented by touching the peduncle frequently with a hair-pencil dipped in butter of antimony.

3. The *carcinomatous polypus* is nothing more than a scirrhous tumour in the nose. It may be known by its occurring to elderly persons; by the cancerous cachexia, the hardness of the tumour, and lancinating pain.

4. The *fungoid polypus* is a soft red tumour, growing with great rapidity, frequently bleeding, and pursuing the ordinary course of fungus hæmatodes. This, like the last, admits only of palliative treatment, and should not be meddled with by the knife.

IV. Chronic Inflammation, and tumefaction of the Schneiderian membrane, produces a constant feeling of weight and stuffing, as from a bad cold in the head, and more or less discharge, which is very apt to be fetid. It is very common in young persons of scrofulous constitutions, and if neglected may lead to a very obstinate ozæna. It is to be treated by applying one or two leeches to the inside of the nostrils, once or twice a week; by keeping the bowels open with mild purgatives, and occasional doses of hyd. c. creta; and by administering sarsaparilla with alkalis, F. 82, &c. Sometimes, in young children, the membrane swells into little red fleshy eminences, which may be touched with nitrate of silver, but must not be mistaken for polypi, nor be meddled with by the forceps.

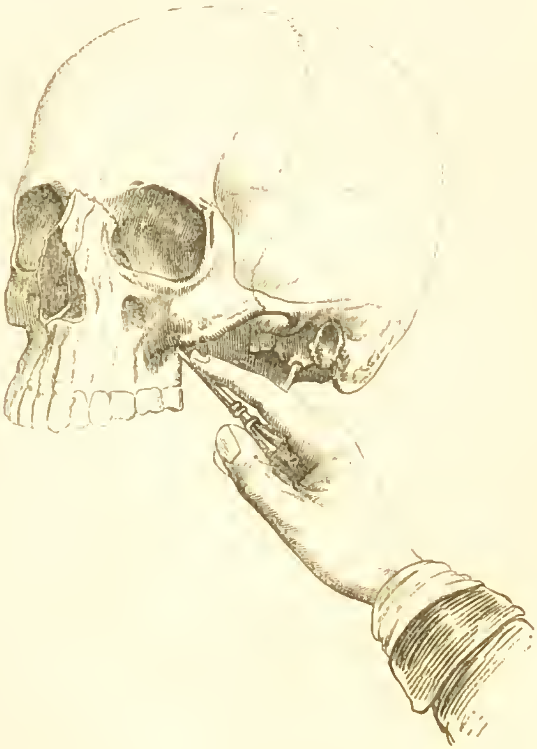
V. Ozæna signifies an obstinate fetid discharge from one or both nostrils. It is, of course, a mere *symptom*, and may depend either on scrofulous inflammation of the Schneiderian membrane; or on ulceration; or on disease of the bones, venereal or scrofulous. Sometimes it depends on the formation of large clots of mucus mixed with false membrane, which adhere and putrefy.

Treatment.—Copious daily injections of warm water, and of astringent lotions of nitrate of silver, sulphate of copper, or of the chlorides of soda and lime, the citrine ointment applied by means of a camel's hair pencil, and attention to the health, are the only remedies.

VI. Imperforate Nostrils.—The nostrils are sometimes *imperforate*, owing to congenital malformation. The passage may (if the parents wish it) be restored by a cautious incision, and must be kept open with bougies. If, however, the obstruction be seated far back, it ought not to be meddled with.

SECTION III.—OF THE AFFECTIONS OF THE UPPER AND LOWER JAWS, AND ANTRUM.

I. ABSCESS OF THE ANTRUM may be caused by blows on the cheek, but it more frequently results from the irritation of decayed teeth. It has been caused in a newly born infant from injuries received during parturition; the face having presented to the pubes.* The *symptoms* are permanent aching and uneasiness of the cheek, preceded probably by acute throbbing pain and fever, and rigors, and followed, if an opening is not made soon, by a slow, general enlargement,—which, if permitted to increase, causes bulging of the cheek, extrusion of the eye, obstruction of the lachrymal duct, depression of the hard palate, loosening and dropping out of the teeth, and closure of the nostril. The parietes of the cavity sometimes become so thin from distension, that they crackle on pressure like parchment. Some-



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* G. A. Rees, Med. Gaz. N.S. vol. iv. p. 860.

times (though rarely) the matter makes its way into the nostril; and sometimes the abscess points externally, or bursts into the mouth.

Treatment—A free aperture must be made into the cavity. If either of the molar teeth is loose or carious, it should be extracted, and a trocar be pushed through the empty socket into the antrum. But if all the teeth are sound, or if they have been all extracted before, an incision should be made through the membrane of the mouth above the alveoli of the molar teeth, and the bone be pierced by a strong pair of scissors or trocar, as represented in the foregoing figure. The instruments should not be made of too highly tempered steel, lest they break. The cavity should be frequently syringed with warm water, in order to clear away the matter, which is sometimes thick like putty. If the discharge continues profuse and fetid, search should be made with a probe for loose pieces of bone, which should be removed without delay, the aperture being enlarged if necessary.

II. DROPSY OF THE ANTRUM.—The antrum may become enormously distended, in consequence of an accumulation of its natural clear mucous secretion, if the aperture into the nostril has become obliterated. In a case which occurred in Mr. W. Fergusson's practice in the King's College Hospital in 1850, there was great protrusion of the cheek, and of the hard palate, and other signs of tumour, so that the patient was sent up for the purpose of having the bone extirpated; but on examination it was discovered that the antrum was greatly distended with a yellow viscid fluid containing brilliant particles of cholesterine; and an opening having been established through the anterior wall of the cavity, the patient was soon discharged cured.* In some cases the parietes are so thin as to crackle on pressure.

III. FUNGUS MEDULLARIS may commence in the lining membrane of the antrum, or in the sockets of the adjoining teeth. In its first stage it causes a sense of weight and stuffing, with perhaps epistaxis, which usually gives relief to the symptoms for a time. Then the cheek bulges out, in the form of a hard tumour. After a time, some portion of it feels soft and pulpy, and then bleeding fungous tumours project from the cheek, or into the mouth, or into the orbit, causing horrid pain and deformity, with profuse fetid discharge; protruding the eye from its socket, and leading to the inevitably fatal results of fungus hæmatodes.

Treatment.—The only remedy is extirpation of the superior maxillary bone; but, to be of any use, it must be performed before the diseased growth has burst from the cavity, and before the skin and lymphatic glands have become implicated.

IV. A NON-MALIGNANT OR FIBROUS TUMOUR is not unfrequently developed in the antrum, or on the external surface of the superior maxillary bone. On a section, it appears a dense, homogeneous, fibrinous mass, containing spicula of bone. Its origin is generally ascribed to external injury, or to disease of the teeth. It may be distinguished from malignant disease by noticing that its growth is slow, that its surface is lobulated, that it feels hard and elastic, like brawn interspersed with bony particles; that although the superjacent skin may become turgid and purple with distended veins, still that it does not become incorporated with the tumour; and that although ulceration may accidentally occur on its surface, still that the ulcers are superficial, furnish no fetid discharge nor hæmorrhage, and may heal on the removal of the exciting cause.* These tumours may, if suffered to remain, entirely obstruct the nose and mouth, and so cause suffocation or starvation.

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* Med. Times, 18th May, 1850.

Treatment.—The tumour must be extirpated entirely, but an exploratory puncture should first be made in order to prove that the case is not one of mere collection of fluid. If of moderate size, and situated towards the front of the bone, the aperture of the mouth may be enlarged by an incision from the ala of the nose to the margin of the lip; if very small, this may not be necessary. At all events, "the mucous membrane and cheek must be dissected off the tumour as far upwards and backwards as its bulk renders necessary; then an incisor tooth and bicuspid or molar must be extracted, and the point of the knife be carried through the mucous membrane of the hard palate, and every soft texture which it can reach, where it is intended to effect the separation:" then the bone on either side of, and above the tumour, must be grooved with small saws, of various sizes, after which its separation must be completed with the cutting forceps.

If, however, the tumour is of larger dimensions, so that it not only protrudes in front, but also encroaches on the nostril, and pushes the eyeball upwards, it will be necessary to remove the whole of the superior maxillary, and perhaps the malar bone also. Mr. Fergusson has effected this by incisions much more limited than formerly. He makes a clean cut through the upper lip, and carries it into the nostril; the gum is then dissected away from the hard parts, and the flap is turned upwards, so that by care the entire jaw may be exposed, and the greater portion of it be removed. The great benefit of this plan is, that hardly any disfiguration is left after the wound has healed up, and there is very little bleeding of consequence during the operation. If the malar bone and the floor of the orbit are to be removed, an additional cut must be made from the corner of the mouth to the angular process of the frontal bone. The flap is then dissected up, the infraorbital nerve divided, the inferior oblique muscle and other parts separated from the floor of the orbit, and supported with a narrow bent copper spatula; the nasal process of the superior maxilla, and its junction with the malar, are divided with strong bone forceps (or, if the malar is to be removed, its junction with the frontal and zygoma must be divided instead) a notch must be made with strong scissors in the alveolar process of the middle incisor tooth (which should be extracted before the operation); then the anterior half of the roof of the mouth must be divided with a pair of strong cutting forceps, one blade being put into the nostrils, the other into the mouth. The tumour, being thus loosened, is then to be forcibly moved, and its remaining attachments are to be divided with the knife, carefully preserving the velum palati. If the floor of the orbit is not implicated, it should be permitted to remain; and for this purpose, instead of cutting through the nasal process of the superior maxilla, the bone must be sawn horizontally just below the orbit. During the operation, the common carotid is to be compressed, to prevent hæmorrhage. After it, the facial, and any other arteries that require it, are to be tied, the chasm to be filled with lint, and the wound closed with sutures.*

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* "Softness and rapidity of growth are," says Mr. Fergusson, "most indicative of malignancy in such cases; and if combined with these, the limits are indistinctly defined, and there are constitutional indications of such a growth, the disease is evidently one of a serious character. If, on the other hand, the swelling is hard and slow of increase; if the distinctions between it and the surrounding parts are apparent; if the person seems otherwise in good health, and in nowise disturbed by the swelling excepting by the inconvenience resulting from its bulk, then there may be every reason to suppose that it is benign in its character."—*Practical Surgery*, p. 483.

V. FISSURE OF THE PALATE.—As the upper lip may be fissured, through defective development, so also may the various parts constituting the hard and soft palate. In some cases the uvula merely is fissured; in others the cleft extends forwards as far as the lips, and may be combined with a hare-lip. The fissure in the hard and soft palates is invariably in the mesial line, but when it extends forwards through the alveoli, it diverges somewhat to one side. In a few cases the fissure is double in front, so that it may, as a whole, be compared to the letter Y, the two lines in front having the intermaxillary bone between them.

This affection, when extensive, necessarily causes very great difficulty in sucking and swallowing; and if the child grows up, it causes a very serious impediment to articulation.

Treatment.—When the fissure extends from back to front entirely through the hard and soft palate and lip, the lip should be operated upon early, in the manner described when speaking of hare-lip. The fissure in the soft palate may at puberty be united by a somewhat similar operation, which is known by the name of *Staphyloraphy*, and which has lately been very greatly improved by Mr. W. Fergusson, who for the first time has submitted the malformed parts to dissection, and thus has enabled us clearly to understand the operation, and to overcome the difficulties which attend it.

It has been often remarked that the action of the muscles upon the edges of the fissure in the soft palate was difficult of explanation. If the deformed part is examined whilst perfectly quiescent, the gap is seen conspicuously, the lateral flaps are distinct, and the posterior nares, with the upper end of the pharynx, are observed above and behind them. If now the flaps are touched, they will in all probability be jerked upwards; and if they be still further irritated, each flap will be still more forcibly drawn upwards and outwards, so as hardly to be distinguishable from the rest of the parts forming the sides of the nostrils and throat. But on the other hand, if the pharynx be irritated, and made to perform the act of deglutition, the margins of the fissure will be brought together.

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* Vide Fergusson's Practical Surgery, 2nd edit. p. 507; also Lancet, Feb. and March, 1842, also Liston on Tumours of the Face, Med. Chir. Trans. vol. xx.

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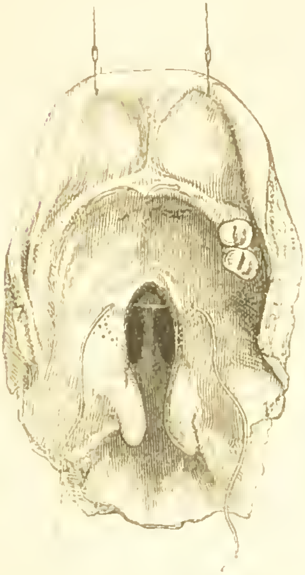

Now it is easy to understand both that the separation of the flaps must be produced by the action of the palatine muscles, and also that this must occasion a very serious impediment to any operation for uniting them by adhesion; but the muscular action *by which the flaps are brought together* was a mystery till Mr. Fergusson showed that it was caused by the upper semicircular border of the superior constrictor muscle of the pharynx, and to him is due the credit of proposing that the muscles which tend to separate the flaps should be divided, instead of endeavouring to counteract them by random incisions in the soft palate, as had been the practice of surgeons previously; and of showing what the muscles are, which really need to be divided; viz. the levator palati, and palato-pharyngeus.

The operation is thus described by Mr. Fergusson: — "With a knife whose blade is somewhat like the point of a lancet, the cutting edge being about a quarter of an inch in extent, and the flat surface being bent semicircularly, I make an incision, about half an inch long, on each side of the posterior nares, a little above and parallel to the palatine flaps, and across a line straight downwards from the lower opening of the Eustachian tube, by which I divide the levator palati on both sides, just above its attachment to the palate. Next I pare the edges of the fissure with a straight, blunt-pointed bistoury, removing little more than the mucous membrane; then, with a pair of long blunt-pointed curved scissors, I divide the posterior pillars of the fauces, immediately behind the tonsil, and if it seems necessary, cut across the anterior pillar too; the wound in each part being about a quarter of an inch in extent. Lastly, stitches are introduced by means of a curved needle set in a handle; and the threads being tied, so as to keep the cut edges of the fissure accurately in contact, the operation is completed."

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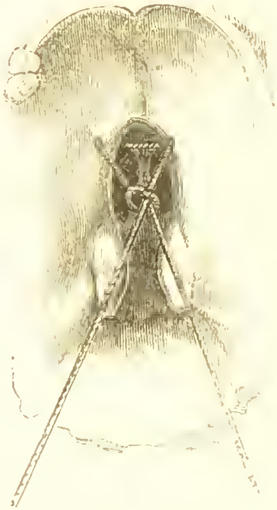
[*] From a preparation of Mr. W. Fergusson's in the King's College Museum.

The patient should be intelligent and quiet; and not under 12 or 14. The parts must be well dissected from the hard palate, by which means all tension will be taken off, and the sides of the fissure will fall loosely together, and the stitches may be now applied. It is *highly important* that a sufficient number of stitches be introduced. The greatest strain will be generally at the anterior extremity of the fissure, where the soft parts are most firmly connected with the bones. The stitches are introduced by means of a curved needle set in a handle. "The point of the instrument, armed with a smooth round waxed silk thread, is passed from below upwards about a quarter of an inch from the cut margin of the fissure and made to appear in the middle of the gap, when the thread is seized with forceps, drawn three or four inches out of the mouth, and then the needle is withdrawn. A similar manœuvre is followed on the opposite side; the two threads are then tied together by the ends, which have thus been drawn out at the mouth; and by withdrawing one of them, the other will be carried through the aperture opposite to that where it was first introduced. Hitherto the thread has been double; now one end must be drawn through the apertures and out at the mouth, and so the thread is ready to be tied. Two, three, four, or five threads are introduced in this way, and then after the cut margins of the flaps are sponged free of blood and mucus, the various threads are fastened." The knot is shown in the adjoining cut. After the operation has been finished, the patient must be kept perfectly quiet. Milk, broth, and beef-tea may be given, but it is better that the patient should not take anything for some hours after the operation until the parts have become somewhat quiet.



The surgeon need not be in any great hurry to remove the stitches. Mr. Fergusson in his early operations was in the habit of taking them away on the second day after the operation, but latterly he has permitted them to remain longer. "It is better, in my opinion, to let the threads remain several days too long than that they should be moved a minute too early. Usually, I take one or two stitches away on the third or fourth day, and on the fifth or sixth remove them all. It is better, I think, to take them out at intervals, than all at once."

Fissures in the anterior part of the bony palate may be diminished by lateral compression during growth ; and, after puberty may be palliated by means of an *obturator* of gold or caoutchouc. If the obturator used be too large, it may cause absorption of all the bones, or add greatly to the evil it is intended to cure.* Otherwise, relief may be attempted by means of an operation first proposed by Dr. J. M. Warren, of Boston. This consists in paring off the tissues from the bones on each side of the fissure, in two lateral flaps, and stitching these together in the mesial line.†

VI. TUMOURS OF THE LOWER JAW may, like those of the upper, be either simple or malignant. Their distinctive characters have been before alluded to. Free extirpation is the only remedy. If the tumour is large, and situated near the middle of the bone, it must be exposed by making an incision from each angle of the mouth down to the bottom of the chin; a tooth must be extracted on each side of the tumour; next the bone may be sawn half through perpendicularly on each side, and then be divided completely by the straight cutting forceps, one blade being passed up on the inner side of the bone, and the other placed in the groove made by the saw; and, lastly, the parts attached to the inner side of the bone must be cautiously divided; namely, the digastric, mylo-hyoid, genio-hyoid, and genio-hyo-glossus muscles. When the attachments of these muscles are divided, care must be taken not to let the tongue retract into the throat, which might push back the epiglottis and cause suffocation. To prevent this, a ligature may be passed through the tip of the tongue, by which it may be held forwards during the operation, and which may be fastened to the twisted suture by which the wound is afterwards to be closed.

If, however, the disease is not so very extensive, it may not be necessary to sacrifice the whole thickness of the bone, but a horizontal portion of the base of the bone may be saved, which will prevent the chin from falling in after the operation. In order to effect this, the bone may be sawn downwards for half its depth on each side of the tumour, and a horizontal cut be made below it ; and then the diseased portion be separated completely with the cutting pliers.

If a lateral portion is to be removed, an incision should be made from the lower lip to the chin, and along the basis of the bone, to its posterior angle. Thus a flap is formed, which may be turned up so as to furnish a good view of the tumour, and then the bone is to be divided as before described.

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* See a case related by Mr. Paget, Med. Gaz. N.S. vol. v. p. 104.

† For further information, vide Fergusson's Practical Surgery, 2nd edition, and his paper in Med. Chir. Trans. vol. xxviii.; Medical Times, No. 388, and 389; and Lond. Journ. of Medicine, Jan. 1849.

If the extent of the disease renders it necessary to remove the entire side of the bone, and to separate it from its articulation with the temporal, the operator must begin by making a curved incision from beneath the ear, along the basis of the jaw to the chin. The flap so formed is to be dissected up, and the masseter with it; an incisor tooth is to be removed, and the bone to be sawn vertically through; the end is next seized and depressed, and the temporal muscle dissected from the coronoid process; the pterygoid muscles and other internal attachments are then to be divided, and finally the ligaments of the joint. Whilst effecting the disarticulation of the condyle, the point of the knife should be kept close to the bone, so as to avoid all risk of wounding the external carotid artery. After bleeding has been restrained, the wound is to be closed by sutures, excepting at the middle, where an aperture should be left for the ligatures, and to permit the escape of discharge.*

VII. Necrosis of portions of the jaws is occasionally the result of mechanical violence, carious teeth, or violent salivation; but of late years a new source of this disease has been detected in *phosphorus.* This when imbibed by persons employed in lucifer match manufactories, especially if they have carious teeth, may cause inflammation of the periosteum, with thickening and infiltration, followed by inflammation and abscess, and resulting in necrosis of a portion of bone with extensive sloughing of the soft parts around. The health is much broken down; the discharge particularly fetid and copious. "With loss of appetite, sallow countenance, and feeble circulation," says Mr. Stanley, "the first indication of the disease is usually toothache, followed by the dropping out of the teeth, more especially of the grinders, and then by the death of a portion of the jaw." There is no reparation subsequently as in common necrosis.

Treatment.—In the earliest stage, free incisions through the gums and thickened periosteum; when necrosis has taken place, deodorizing lotions copiously applied; meat beaten to a pulp, and other nourishing food; loose portions to be removed as soon as detached.†

VIII. Closure of the Jaws, with more or less inability to open the mouth, and to masticate solid food, may be a result of disease of the bone implicating the joint; or of rigid cicatrices within the mouth produced after sloughing, whether caused by drinking boiling water, or by the profuse administration of mercury. The division of any rigid bands of cicatrices, the division of the masseter muscle by subcutaneous section, a narrow knife being thrust from the mouth between the muscle and the skin, an operation which has been successfully performed by Mr. W. Fergusson, and the use of a screw dilator, are the only available remedies.

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* Vide Liston's Elements of Surgery, and Practical Surgery, 2nd edition; Guthrie in Med. Gaz. vol. xvii.; Brodie, ibid. vol. xv.; Liston on Tumours of the Face, in Med. Chir. Trans. vol. xx.; Bell on the Teeth; Jobson on the Teeth; and Fergusson's Practical Surgery. Disease of the lower jaw requiring amputation has been caused by a projection anteriorly of the coronoid process, which hindered the evolution, of the wisdom tooth. Forbes's Rev. vol. viii.

† Vide Stanley on the Bones, and a Lecture by Mr. Simon, Lancet, 12th Jan. 1850.

SECTION IV.—OF THE AFFECTIONS OF THE MOUTH AND TONGUE.

I. SMALL TUMOURS, semitransparent and fluctuating, containing a glairy matter, and probably consisting of obstructed mucous follicles, are often met with on the inner surface of the cheeks and lips.

II. RANULA is a tumour of the same nature, situated under the tongue. It may consist either of one of the Whartonian ducts, or of a follicle obstructed. This and the foregoing tumours are best treated by snipping out a small piece of the sac, and rubbing the interior with lunar caustic; or by passing a small seton through the sac.

III. TONGUE-TIE signifies a prolongation of the frænum linguæ. confining the apex of the organ to the lower jaw. It is usually detected by the difficulty which the infant has in sucking; and may easily be relieved by dividing the frænum with a blunt-pointed pair of scissors,—taking care to direct their points downwards, and to keep as close to the lower jaw as possible, so as to avoid the lingual artery.

IV. WOUNDS of the tongue are liable to be attended with severe hæmorrhage from the lingual artery. If the bleeding orifice cannot be tied, one or more ligatures must be introduced with curved needles, so as to include and constrict the bleeding parts; or a heated iron may be applied through a tube.

V. INFLAMMATION of the tongue, known by great swelling, tenderness, and difficulty of speaking and deglutition, must be treated by bleeding and leeches, purgatives, slight incisions, and the antiphlogistic regimen generally. Inquiry should be made whether the patient has been taking mercury. If abscess form, the fluctuating part should be opened.* Abscesses are liable to form under the tongue, and to cause suffocation by their pressure on the glottis: an incision beneath the chin, through the mylo-hyoid muscle is the only resource.

VI. HYPERTROPHY.—Slow enlargement, without tenderness or structural disease, sometimes affects the tongue, causing it to protrude permanently from the mouth. The superfluous portion may be removed by ligature,—a needle armed with a strong double ligature being passed through the centre of the tongue, and one thread being then tied very tightly round each half. But if it be not very considerable, a Λ shaped portion may be cut out from its anterior extremity, and the cut surfaces be united by suture after the bleeding vessels are tied, and oozing has ceased.

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* Sometimes the tongue enlarges suddenly to an immense size, so as almost to cause suffocation, but without any symptoms of inflammation properly so called. A case which proved fatal in spite of bleeding, leeching, calomel, and incisions, is related by Mr. Lyford, of Winchester, in the Lancet for 1828, p. 16;

VII. CANCER.—A foul excavated ulcer, with extremely hardened base, and prominent edges, with burning and lancinating pain, and preceded by nodular deposit below the mucous membrane. The constitutional symptoms are those of the cancerous cachexia.

Treatment.—The diseased part should be early extirpated with the knife; or, if extensive, with ligatures, in the manner before described.

VIII. ULCERS ON THE TONGUE, presenting very formidable characters, and hardly distinguishable from cancer, sometimes arise from the irritation of rotten teeth, or from disorder of the health. Like similar ulcers on the skin, they consist of an hypertrophied and altered state of the epithelium, and contain, according to Hughes Bennett, no real cancer cells. The indications are, to remove rough teeth, to keep up the secretions, to regulate the diet, and support the strength. Plummer's pill, sarsaparilla, or F. 87, arsenic, hyoscyamus, and conium, and the local and general treatment of *irritable* ulcers, will be of service; if not, the diseased part should be extirpated.*

IX. STAMMERING.—This affection requires to be noticed here, because two operations, within the last few years, have been proposed for the cure of it. They consisted in making deep gashes in the tongue, and in extirpation of the uvula and tonsils,—proceedings so barbarous and irrational, that it is surprising that surgeons could be found to do, or patients to submit to them.

SECTION V.—AFFECTIONS OF THE TEETH AND GUMS.

I. LANCING OF THE GUMS of children may be performed for two reasons. If the gum is swelled, inflamed, and tender, and a tooth not quite ready to come through, a free but shallow incision may be made in it with a fine lancet, for the purpose of letting blood flow. But if it is tightly stretched over a tooth, which is bursting through, the incision should be carried down to the bottom so as to release it entirely.

II. IRREGULARITY OF THE PERMANENT TEETH is a consequence of contracted and ill-formed jawbones. If either of the canine teeth, or of the incisors of either jaw, project much, the patient should be taught perpetually to endeavour to push it back into its proper situation with his fingers. But if at the age of fourteen or fifteen this method has not succeeded, and the teeth are much crowded, the projecting tooth

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a similar case, cured by purgatives and incision, by Mr. Taynton, Med. Gaz. vol. xii.; who speaks of it as the only case he had seen in a practice of forty years; and one by Mr. Collins (*ib.* p. 642) in a pregnant woman, cured by an incision in the raphé on the under surface.

* See an interesting case, Hughes Bennett, op. cit. p. 126.

may be removed, although in many cases it is better to sacrifice one of the bicuspides to make room for it. If a growing child is *underhung*, so that the under incisors come in front of the upper ones when the mouth is shut, or so that the teeth meet at the cutting edges, instead of the lower teeth being received within the upper, the child should be encouraged daily to push the upper teeth forwards with its tongue and fingers; and should frequently put the end of a spoon-handle behind the upper incisors, and then close the mouth, using the spoon as a lever to press the upper teeth forwards and the lower ones backwards. But if these simple means do not succeed, recourse should be had to the appliances used by professional dentists.*

The *wisdom teeth*, especially in the lower jaw, are extremely liable to be misplaced; growing directly outwards or inwards, and producing ulceration of the cheek or tongue; or projecting forwards against the neighbouring molar, or backwards into the coronoid process, or even being contained within a tumour in the substance of that process. Tumours of either jaw may likewise arise from mal-development of either of the other teeth.

III. FRACTURE AND DISLOCATION OF TEETH.—If a portion of a tooth is broken off, without exposing the pulp cavity, the exposed surface should be filed smooth, and then no inconvenience will probably follow. If it is snapped off at the neck, and the pulp cavity is exposed and very painful, it should be touched with lunar caustic, and the mouth be frequently bathed with strong poppy decoction; and when pain and tenderness have ceased, an artificial tooth may be fastened by a pivot to the stump. If, however, the root of the tooth is loosened, it had better be extracted at once. If a tooth is loosened by a blow, it should be fastened by silk to its neighbours. If a tooth is entirely driven out, it should be replaced as soon as bleeding has ceased, and be fastened in by silk; no food should be allowed that requires mastication, and inflammation should be combated by repeatedly leeching the gum.

IV. CARIES OF TEETH signifies a successive softening and decay, gradually spreading till it reaches the central cavity of the tooth, which from that time is subject to fits of toothache. This disease seems to depend on original imperfect formation of the enamel and bone, through which they are incapable of resisting the solvent process of the fluids met with in the mouth, and it may further be caused by circumstances which lower the general health; fevers, salivation, the scrofulous diathesis, &c.

Treatment.—If the caries be slight and recent, the whole of the decayed portion should be removed by proper instruments, and the cavity be filled up with gold, or an amalgam of silver and mercury. But if the decay has advanced far towards the pulp cavity, or has

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* A good account of which will be found in Mr. Tomes's Lectures on Dental Surgery. in the Lond. Med. Gaz. vols. xxxvii. and xxxviii., since published by J. W. Parker Lond. 1848.

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laid that open, it may be necessary first, to use some applications to deaden the sensibility of the tooth, so as to enable it to bear the stopping, and to protect it meanwhile from contact with food and saliva. For these purposes the best plan is, to fill the cavity with a bit of cotton wool, dipped in a solution of mastic in Eau de Cologne, or in alcohol: or in solution of gutta percha in chloroform: vide F. 183. By these means the tooth may very probably be brought into a state to bear stopping with gold. The patient should avoid exposure to cold, errors in diet, and drinking very hot, or cold, or sweet, or acid fluids.

V. TOOTHACHE.—When the cavity of a tooth has been laid bare by caries, the delicate nervous pulp contained in it, is extremely liable to pain from contact with the liquids of the mouth; and if the health be at all out of order, or if it be much irritated, it is liable to acute inflammation, with most agonizing toothache.

Treatment.—We believe the best treatment for this kind of toothache to be as follows:—let the patient have an aperient dose; confine him to spoon diet; let him wash out the mouth with a solution of carbonate of soda in water; let the gum around the tooth, and between it and its neighbours, if tumid, or tender, be deeply scarified with a fine lancet; then let the cavity be filled loosely with a little bit of cotton dipped into the solution of tannin and mastic, F. 183; and if the toothache is curable at all, this plan, with a little patience, will be almost sure to succeed. If the pain is very violent, half a grain of powdered acetate of morphia may be taken up with the cotton imbued with the tannin; which should be warmed before it is put into the cavity. In some few cases, a whiff of chloroform will lull the pain. As soon as the pain is relieved, the tooth if of use should be stopped with gold or amalgam; if of no use, it should be extracted.

Other remedies occasionally of service are, *warm poultices* to the cheek; *sialagogues*, especially a little piece of pellitory chewed; *anodynes*, especially warm poppy decoction held in the mouth; or a full dose of Battley's Liq. op. sed. at bed-time, if the bowels have been well cleared: *stimulant*, escharotic and astringent substances introduced into the cavity of the tooth, such as a drop of strong solution of nitrate of silver, or solution of alum or of tannin; respecting which last substance the author is most grateful to acknowledge the benefit he has derived from it, since it was introduced by his friend Mr. Tomes. It may be added, that most of the violent, burning, empirical nostrums, such as creosote, oil of thyme, &c., although they may be of service when introduced in small quantity by a skilful hand into the carious tooth, at the right time, yet that when employed indiscriminately, as they are by the vulgar, they can do nothing but mischief.

It may be remarked that the gum in the interstice between a decayed tooth and its neighbour, often becomes spongy, and swelled, and excessively sensitive; giving rise to a very wearing kind of tooth-

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ache; and causing excruciating pain if a portion of the food happens to be pressed down upon it. This may be relieved by a deep incision through the swollen gum, and the use of tannin gargle, of pellitory chewed, and of such aperients, F. 34, 35, as tend to unload a congested mucous membrane.

VI. INFLAMMATION of the *central pulp* sometimes affects a tooth that is apparently sound. It occasions severe, heavy throbbing pain extending to the head, and considerable tenderness of the tooth and of the gum around. It may lead to suppuration of the pulp, or to abscess in the alveolus, and death of the tooth in consequence.

Treatment.—Leeches, low diet, and purgatives.

VII. When a tooth is partially decayed, it very frequently causes *inflammation of the* PERIOSTEUM *of its socket*, which swells and so causes the tooth to feel looser, and longer than natural. The gum around the neck of the tooth is generally highly vascular. This state of things often ends in a *gum-boil*, or *alveolar abscess*. A leech, or a deep incision in the gum between the diseased tooth and its neighbours, and fomentations of poppy to the interior of the mouth are the remedies.

VIII. NEURALGIC toothache, whether it occurs in teeth that are entirely sound, or partially carious, is to be distinguished by its occurring in paroxysms which come and go suddenly, in more or less regular intervals. It is very common in the earlier months of pregnancy.

Treatment.—Quinine or the carbonate of iron in large doses, together with aperients and alteratives, are the most successful remedies.

IX. *Toothache* sometimes has the characters of chronic RHEUMATISM; flying about the jaw, affecting no tooth in particular, and not relieved by extraction, so much as by blue pill and aperients, with small doses of colchicum.

The muriate of ammonia, in half-drachm doses, every four hours, dissolved in water, and the iodide of potassium, deserve a trial in these and other obstinate cases of toothache.*

X. It sometimes happens that the fang of a tooth is thickened by a deposit of bone; in which case the tooth becomes affected with severe pain that can hardly be distinguished from that of neuralgia. It sometimes occurs on teeth that are perfectly sound, but more generally on carious teeth, or stumps. The excessive pain of this affection is in general only to be relieved by extraction.

XI. NECROSIS OF TEETH.—A tooth is said to be necrosed when it has become black and unsightly, and loose in its socket. This affection may be caused by blows which have torn across the nutrient vessels, or by inflammation of the pulp (perhaps from the abuse of mercury). Extraction must be performed, if the tooth cause inflammation or other inconvenience.

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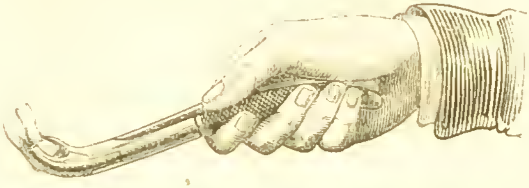
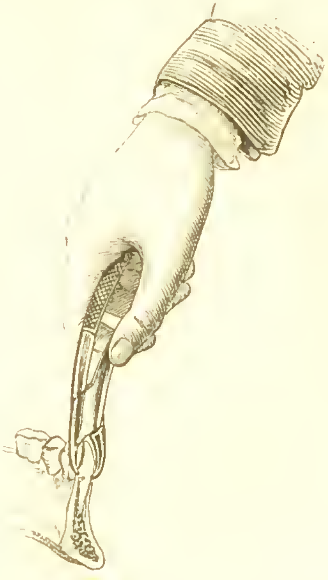
* Vide Dr. Watson's Lectures, Lect. 39.

XII. EXTRACTION OF TEETH.—The instruments for extracting teeth are the forceps, the elevator, and the key.



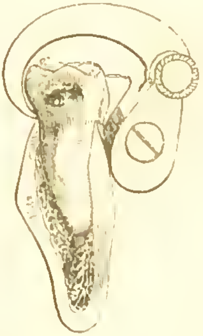
1. *The forceps* is the instrument that is now generally employed by dentists. It should be made with sharp edges, so that it may be pushed up between the tooth and the gum, and should seize the tooth by its neck, close to the alveolus. For this purpose also, the jaws of the instrument should be made to incline towards each other in such a way, that they may slip up and embrace the neck of the tooth accurately when the handles are pressed together; and they should be ground in such a manner that they may be adapted accurately to the shape of each tooth. For this purpose, the surgeon will require several sets of instruments. Two are required for the upper molars, one for each side, because of the third fang which projects inwards. The adjoining figures show the manner in which they should fit the depressions and elevations of the tooth. One will suffice for the lower molars, both right and left, because they have only two fangs. One instrument will be necessary for the bicuspides and canines of the upper jaw, and another for those of the lower jaw; and two sets will be necessary for the incisors of either jaw.



In extracting teeth by the forceps, there are two things to be done; first to loosen the tooth, and then to pull it straight out. In extracting the incisors and canines of the upper jaw, they may first be loosened by giving them a gentle twist combined with a slight rocking motion, and then may be pulled perpendicularly downwards with a slight inclination backwards. The incisors and canines of the lower jaw are to be loosened by giving them a firm but gentle notion backwards and forwards, and then may be pulled straight up. The bicuspides and molars are to be loosened by moving them from side to side, so as to make the alveolar process yield a little, and then they may be pulled perpendicularly, upwards or downwards, as the case may be. The operator should grasp the forceps firmly, in such a manner that it may move altogether with his hand; but yet not so forcibly as to run the risk of crushing the tooth. The two preceding figures were sketched by Mr. W. Bagg from the hand of Mr. Tomes.

2. *The elevator* is highly useful for stumps, and for old straggling teeth. The point is to be thrust firmly down between the tooth and its socket, and then by bringing the instrument into a horizontal position, and making a fulcrum of the edge of the alveolar process, or of the adjoining tooth, or of the operator's fingers, the tooth may be lifted out.

3. *The key* is an instrument that is often employed for the extraction of the bicuspides and molares; but it is more painful than the forceps, and every one must know instances of laceration of the gum, and splintering of the alveoli, followed perhaps by tedious exfoliation, that have been produced by the clumsy use of this instrument; not to mention the risk of the claw slipping from the decayed tooth and dragging out a sound one instead. If, however, it is preferred, care should be taken to select an instrument of proper size, and to place the fulcrum in a proper position. If the key is too small, and the fulcrum too high, very probably the crown of the tooth will be snapped off. If the key is too large, and the fulcrum too low, either the claw of the instrument may be snapped across, or the alveolar process be extensively splintered. The adjoining figure is intended to show the right position, which will draw the tooth more or less perpendicularly from its socket. The fulcrum ought to be placed on the *inner* side, for the bicuspides of the lower jaw, and molars of the upper; and on the outer side for the molars of the lower jaw. The *dentes sapientiæ* of the upper jaw should never, according to Bell, be extracted with the key, because of the delicate texture of the bone on which the fulcrum must rest.



Before extracting teeth with the key, it is usual to cut away the gum from their necks by means of a gum lancet; a practice which some authorities consider unnecessary. It certainly is unnecessary in the majority of cases, especially for the extraction of the temporary teeth, and of the teeth of old persons which have separated from the gum, and become loose in their sockets; yet it may be performed either if the gum has been subject to repeated inflammation, which renders it adherent to the tooth, and liable to be lacerated on its removal; or secondly, in order to afford room for the claw, if the tooth has decayed down to the gum. Some persons, instead of using a lancet, separate the gum by means of a small tenaculum.

XIII. HÆMORRHAGE *after Extraction of Teeth.*—This operation may be followed by very severe and dangerous hæmorrhage, which sometimes appears to come from the dental artery at the bottom of the socket; sometimes from the gums, when they have been long diseased. The cavity must first be cleared of all coagulum; then a piece of *matico* leaf, or a little strip of lint loaded with powdered matico; or a bit of nitrate of silver may be put into the socket; but if neither of these remedies succeeds, the alveolus must be plugged in the following way: It is first to be cleansed from coagulum; then one end of a long thin strip of lint is to be firmly pressed into it, so as to come into contact with its very bottom, and the remainder in successive portions is to be forced in till the socket is filled up to the level of the gum. A compress should then be placed on the part, thick enough to be pressed upon by the antagonist teeth, and the mouth should be kept firmly closed by a bandage passing from under the chin to the vertex.

XIV. TARTAR, or *salivary calculus*, is an earthy matter deposited on the teeth from the saliva. It is found most abundantly on the superior molares and inferior incisors, obviously because those teeth are nearest the orifices of the salivary ducts. If suffered to accumulate, it causes inflammation and absorption of the gums, and gradual loosening of the teeth.

Treatment.—The deposit of this substance is to be prevented by taking care not to disorder the stomach, and by the strictest cleanliness. The teeth should be cleaned at least twice a day, with a soft tooth-powder (camphorated chalk is the best) and a little soap. The hairs of the tooth-brush should be soft, and not too closely set; so that they may penetrate the better into the interstices of the teeth. When any quantity of the tartar has accumulated, it should be removed by the *scaling instruments.* The edge or point of the instrument is to be introduced between the concretion and the gum, so as to detach the former in flakes; in the meanwhile a finger or thumb, guarded with a towel, should be pressed firmly on the cutting edges of the teeth, so that they may not be loosened by the force necessarily employed. Sometimes a small portion of this substance is found sticking in the orifice of one of the salivary ducts, and creating great discomfort by its irritation. It may be easily removed.

XV. INFLAMMATORY ABSORPTION, vulgarly called *scurvy* of the gums, generally affects middle-aged or elderly people, and may be a consequence of the accumulation of tartar, but more frequently depends on a congested state of the liver and bowels. The gums are swollen, spongy, exceedingly tender, and subject to constant aching pain, and they bleed on the slightest touch. If the disease proceeds, they separate from the teeth; the alveoli gradually become absorbed, and the teeth loosen, and at last fall out. These consequences are sometimes speedy, and are attended with suppuration in the alveoli, but more frequently they are slow, the teeth dropping out one by one in the course of years.

Treatment.—The gums should be unloaded by deep and free scarifications and repeated leechings: the bowels should be well cleared by a course of purgatives; and gargles should be employed to correct the secretions of the mouth, and excite the vessels to contract. Whilst there is much pain and soreness, dec. papav. vel anthemid., or three drachms of nitre dissolved in a pint of barley-water will answer best. Subsequently, recourse may be had to F. 109, 111, &c.

XVI. Gum Boil (*alveolar abscess, parúlis*) is a small abscess commencing in the socket of a tooth, and bursting through the gum, or sometimes through the cheek. It is usually caused by the irritation of a dead or carious tooth.

Treatment. — Fomentations; removal of the tooth, if much decayed; and a puncture as soon as matter can be detected. If the tooth is extracted soon, the sac of the abscess very often comes away with it.

XVII. Epúlis signifies a tumour formed by an hypertrophy of the gum, without any apparent alteration in its structure. It generally commences between two teeth, which it gradually separates, then loosens, and finally displaces, and may spread so as to involve several of them. This tumour is indolent, painless, and of slow growth; but it ought always to be extirpated without delay, because it is sure to increase, and might become the seat of offensive ulceration, or even of malignant disease.

Treatment.—The tooth on either side must be extracted, and the tumour entirely cut out. A portion of the alveolar process must be removed likewise, if necessary, in order to render the extirpation complete.

A similar tumour is sometimes formed when a dead portion of the root of a tooth remains in its socket, and the gum has healed over it. The tumour should be entirely removed with the knife, and the extraneous body should be sought for, and be extracted if possible. *Malignant tumours* of the gums are exceedingly rare; they will, however, be recognised by their rapid growth, and tendency to hæmorrhage.

CHAPTER XV.

OF THE SURGICAL DISEASES AND INJURIES OF THE NECK.

SECTION I.—SURGICAL DISEASES OF THE FAUCES.

I. Acute Inflammation of the Tonsil is known by rapid swelling of the part, great pain in deglutition, and fever. It must be treated by leeches or bleeding, purgatives, gargles calculated to promote the secretion of saliva (F. 107), and the ordinary antiphlogistic routine. If the gland continue to swell, or if it occasion any embarrassment to the breathing, an incision should be made into it to unload the vessels, and give exit to matter. The tongue should be depressed with one fore-finger, whilst a straight bistoury wrapped round with lint except an inch and a half of its point, is plunged directly into the tumour, and made to cut its way out towards the median line. Abscesses behind the pharynx require similar treatment.

II. Chronic Enlargement of the Tonsil is a frequent sequel of repeated inflammation, especially in scrofulous children. It causes sundry inconveniences. The parts are liable to frequent attacks of acute inflammation; deglutition is impeded; the voice is rendered hoarse; respiration is noisy and laborious, especially during sleep; there is more or less deafness from the obstruction of the Eustachian tubes; and suffocation has even been caused by viscid mucus entangled between the swollen glands. The tonsil has been, in rare cases, the seat of malignant disease.

Treatment.—In the first place the system must be strengthened, and the secretions be kept up by proper tonics and alteratives. The iodide of iron, or the combination of corrosive sublimate with tinct. cinchonæ, may often be administered with benefit. At the same time, absorption of the tumour must be promoted by astringent gargles, by swabbing it once a day with strong lotions of arg. nit., or cupri sulph. or liq. iodinii, by applying stimulating, or mercurial, or ioduretted liniments and ointments to the skin. But if these measures fail, and such an operation is deemed necessary, part of the gland should be removed with the knife—a much more expeditious and cleanly method than the ligature. The surgeon seizes the tumour with a hook or *vulsellum* (depressing the tongue with its handle), then introduces a blunt-pointed curved bistoury, and shaves it off, cutting upwards, parallel to the isthmus faucium. The nearest half of the blade of the bistoury should be wrapped in lint, to prevent the lips from being cut; and in operating on the right side, the surgeon will find it most convenient to cross his hands; the left, holding the vulsellum, being undermost. Very little should be removed; not only to avoid hæmorrhage, but likewise because of the possible truth of Mr. Harvey's theory that removal of the tonsils interferes with the development of the genital organs.

III. ENLARGEMENT OF THE UVULA produces tickling cough and expectoration by irritating the larynx. If it does not yield to the treatment directed for enlarged tonsil, it should be stretched and steadied with forceps, and be cut through in the middle with a pair of long scissors.

SECTION II.—SURGICAL AFFECTIONS OF THE ŒSOPHAGUS.

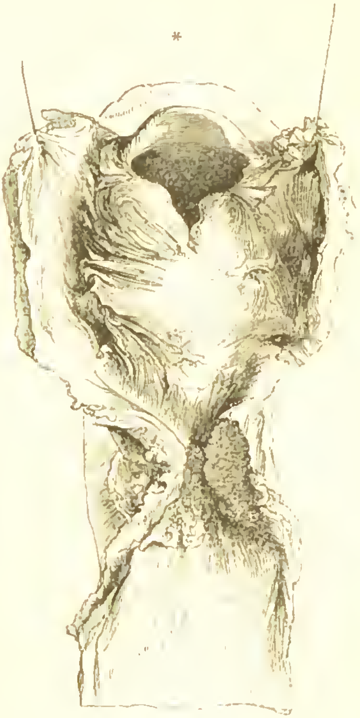
I. SPASM OF THE ŒSOPHAGUS (*spasmodic stricture*) is known by its generally occurring in sudden fits—the patient at a meal finding himself altogether incapable of swallowing, and the attempt to do so producing spasmodic pain and a sense of choking. The *diagnosis* between this and the *organic* or *permanent stricture* is founded on the suddenness of its accession; it being much better at some times than at others; and the fact that the bougie, if passed, either meets with no obstruction, or with one that very easily yields.

Treatment.—This affection always depends on a weakened or hysterical state of the system, or on the presence of some other disorder, as has been mentioned whilst treating of neuralgia. Brodie relates a case that ceased on the removal of bleeding piles; and Mayo, another that was cured by relieving chronic disease of the liver. Tonics, antispasmodics, and alteratives—especially the carbonate of iron thrice a day, with pills of aloes and galbanum at bed-time—exercise in the open air, the shower-bath, and other forms of warm and cold bathing—great attention to the diet—care not to swallow anything imperfectly masticated or too hot, and the occasional passage of a bougie,—are the remedies.

II. PALSY OF THE ŒSOPHAGUS occasions inability of swallowing, but without pain or other symptoms of spasm; and a bougie, when passed, meets with no obstruction. It generally depends on organic disease of the brain or spinal cord, which must be examined into and cured if possible. The patient should be fed by the stomach-pump, by nutrient enemata, and by pushing soft food occasionally down the œsophagus with a probang. The palsy has sometimes been temporarily relieved by electrifying the patient on an insulating stool. Nutrient enemata should be composed of very strong beef or mutton broth, without salt or spice. The quantity injected at one time should not exceed four ounces; and if the rectum does not retain it, a few drops of laudanum should be added.

III. DILATATION AND SACCULATION.—The œsophagus has been found after death exceedingly dilated. The symptoms during life were, great *dysphagia*,—food, when swallowed, never seemed to reach the stomach, and was vomited in a few minutes. If this condition should be ascertained during life, the patient should be fed as in palsy. Sometimes a blind pouch is connected with the œsophagus, and occasions great distress in swallowing, by intercepting the food. It may be formed either by a protrusion of the mucous membrane through the muscular fibres, or by the sac of an abscess which has burst into the tube. The only remedy is, to feed the patient constantly with the stomach-pump, so that the pouch may be allowed to close.

IV. Permanent Stricture of the œsophagus signifies a narrowing produced by an inflammatory thickening of its mucous and submucous coats, which form a firm ring encroaching on the canal. It is generally found just below the termination of the pharynx ; that is, opposite the cricoid cartilage, and is most frequent in females. The *Symptoms* are, difficulty of swallowing, noticed probably for years—gradually increasing—never absent—and occasionally aggravated by fits of spasm. The act of swallowing frequently produces pain in the chest, which shoots between the shoulders, and up to the head. When a bougie is passed, it meets with an obstruction, and displays the impression of the stricture on its extremity. The *causes* of this affection are generally unknown: sometimes, however, it appears to be a sequel of repeated quinsy, or to be caused by swallowing boiling or corrosive liquids ; in one case it appeared to be induced by violent retching in sea-sickness. The *prognosis* is always serious, especially if the complaint is of long duration. If unrelieved, its *consequences* will be ulceration of the œsophagus, either above or below the stricture, with salivation, vomiting of purulent matter, and impossibility of deglutition, which in no long time will be followed by death. The fatal termination may be owing either to sheer starvation, or to the irritation of the local disease, or the extension of ulceration to the lungs.



Treatment. — A mild course of mercury, so as just to affect the gums, occasional leeching, to relieve exacerbations of pain or spasm, combined with hyoscyamus or conium, if there be much irritability, a seton between the scapulæ, and the occasional passage of a bougie, or of a *ball probang*—an ivory ball attached to a piece of whalebone or flexible wire—or of a piece of sponge moistened with a weak solution of nitrate of silver, and attached to a stout copper wire, as recommended by Sir C. Bell, are the remedies. The method of introducing the bougie is as follows: The patient sits upright, with the head thrown as far back as possible, and the mouth wide open. The bougie, which should be previously warmed in the hand and oiled, and gently curved, is passed down into the pharynx in such a manner that its point may slide along the vertebræ. In order that it may not excite cough by interfering with the epiglottis, the patient should be directed to protrude the tongue from the mouth as far as possible ; or to perform the act of deglutition just when the bougie is entering the pharynx. If it meets with an obstruction to its descent, the surgeon should slightly withdraw it, then again press it gently against the obstruction, increasing the pressure for a few minutes if it gives no pain. If it fail to pass, it should be taken out and its point be examined ; and if it bear the impress of a stricture, a smaller one should be tried.

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* This cut exhibits a stricture of the œsophagus. From the Museum of the Middlesex Hospital.

V. ULCERATION of the œsophagus is generally situated at its upper part, and on its posterior surface. It causes great *dysphagia*, and burning pain on the passage of food. If a bougie is passed, it meets with one obstruction just above the ulcer, and with another just below it, and its point returns marked with bloody pus, and presenting the ragged impression of the ulcer.

Treatment.—Alteratives, counter-irritants, and nutrient enemata. The burning pain is sometimes relieved by swallowing small quantities of iced cream.

VI. MALIGNANT DISEASE.—" Infiltrated scirrhus, deposited in a stratiform manner encircling the walls of the tube more or less completely, and causing gradual diminution of its calibre," is the most common form of malignant disease in this part.* It produces at its commencement the same symptoms as stricture, and must be treated in the same manner, by cautious dilatation.

VII. TUMOURS pressing on the œsophagus, whether abscesses, polypi, aneurisms, bronchocele, or enlargement of the bronchial lymphatic glands, will produce all the symptoms of organic stricture. Aneurisms and abscesses have been burst by the passage of bougies—with, of course, instant death in the former case, and relief in the latter. Before performing this operation, therefore, the chest ought to be well scrutinized by auscultation, to detect any unnatural pulsation or *bruit;* and any signs of embarrassed circulation or respiration should not be overlooked.†

VIII. FOREIGN BODIES, when fixed in the PHARYNX, or about the aperture of the larynx, or in the œsophagus, produce a sense of choking, and fits of suffocative cough. This accident, if unrelieved, may prove fatal in two manners. The patient may either be suffocated at once, by spasm of the glottis ; or, if the foreign substance remains impacted, it may produce a fatal ulceration of the parts, attended with exhausting cough and dyspnœa, and profuse fetid expectoration.

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* Walshe, op. cit. p. 271.

† Vide Sir E. Home on Strictures, vols. i. and ii. ; Monro on the Morbid Anatomy of the Gullet, &c. ; Brodie on Local Nervous Affections (*spasmodic stricture*) ; Mayo's Pathology ; Stokes in Cyclop. Pract. Med. vol. ii. ; and Sir C. Bell's Institutes of Surgery, vol. i. ; Arrowsmith's case of Polypus in Œsophagus, Med. Gaz., N. S., p. 165.

Treatment.—The patient should be seated in a chair, with the head thrown back, and the mouth wide open. The surgeon should then introduce his finger—regardless of attempts to vomit—and should pass it swiftly into the pharynx, and search the whole of it thoroughly. When the substance is felt, it may perhaps be entangled in the point of the nail, or curved forceps may be guided to it by the finger. Pins or fish-bones are often entangled about the velum, or in the folds of mucous membrane between the epiglottis and tongue.

If the body has passed into the œsophagus, and it is small and sharp (a fish-bone for instance), it may be got rid of by making the patient swallow a good mouthful of bread. If large and soft (as a lump of meat), it may be pushed down into the stomach with the probang. But large hard bodies, especially if rough and angular, (such as pieces of bone or glass, &c.) should be brought up if possible. A pair of long curved forceps, or a piece of whalebone armed with a flat blunt hook, or with a skein of thread, so as to form an infinite number of nooses, are convenient instruments. If the stomach is full, a dose of tartar emetic dissolved in a very small quantity of water may be administered, in the hope that when the contents of the stomach are vomited, they may bring up the offending substance with them. One case is on record in which a chicken bone lodging in the œsophagus was dissolved by making the patient swallow large quantities of dilute acid. If all means fail, however, and the substance can neither be brought up nor down, and if it be lodged in the cervical portion of the tube, it must be extracted by the operation of œsophagotomy in the following manner.

IX. ŒSOPHAGOTOMY. — This operation should be performed on the side towards which the foreign substance projects. Its situation having been ascertained, an incision of sufficient length must be made through the skin and platysma between the sternomastoid muscle and trachea. The cervical fascia must next be divided on a director. The surgeon must then divide the cellular membrane with a blunt knife, or lacerate it with his fingers, avoiding the carotid and thyroid arteries and the recurrent nerve. A common silver catheter may then be passed down the throat, and be made to project in the wound, so that the œsophagus may be opened by cutting on it. This small wound in the œsophagus should be dilated with forceps, in order to avoid hæmorrhage, and the foreign body should then be extracted. This operation has occasionally been performed for the purpose of conveying food into the stomach in cases of stricture of the œsophagus, but with no very satisfactory results.*

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* Vide Arnott on Œsophagotomy, Med. Chir. Trans. vol. xx.; Report of a

X. USE OF THE STOMACH-PUMP.—The tube of this instrument is to be introduced in the same manner as the œsophagus bougie. It is usual to place a gag in the patient's mouth, having a hole for the tube to pass through, in order that it may not be compressed by the teeth. Before pumping out the contents of the stomach, one or two pints of water should be injected into it, and care should be taken *not to withdraw quite as much* as was injected. More water should then be thrown in, and the process should be repeated till it returns colourless.

The stomach-pump is by no means so universally efficacious as is popularly supposed. It ought only to be employed in those cases of poisoning by opium, or alcohol, or other narcotics, in which the stomach and nervous system are rendered so insensible that vomiting cannot be excited. For, in the first place, the operation is not free from danger. It is a well-established fact, that a tube may sometimes be passed into the trachea of a sensible person without creating any peculiar sensation, or exciting cough; but if the patient be insensible, that accident will be much more liable to happen. In fact, a case is on record in which a meddling surgeon, with more zeal than knowledge, did actually pass the tube down the trachea. and inject the lungs with chalk mixture, which he had far better have permitted his luckless patient to have swallowed quietly; and Sir C. Bell tells us, that he has seen on dissection both lungs filled with broth, which was intended to have been injected into the stomach. Again, it is known that in one case the mucous membrane of the stomach was sucked into the holes of the tube, and torn into strips,—a thing likely to happen if the stomach is pumped too empty. Besides, this artificial evacuation of the stomach is by no means so efficacious as free vomiting, assisted by plenty of diluents. Lumps of arsenic were left in the stomach, in the very case just cited, in which the mucous membrane was torn.*

SECTION III.—SURGICAL AFFECTIONS OF THE LARYNX AND TRACHEA.

I. FOREIGN BODIES IN THE LARYNX AND TRACHEA.—It sometimes happens that a person who is busily laughing and talking during a meal, suddenly rises from table, attempts to put his finger into his throat, speedily turns blue in the face, and then drops down dead. This arises from a piece of food getting into the *rima glottidis*, a thing liable to happen if a sudden inspiration be made through the mouth, as in laughing, when the mouth is filled with food. It rarely happens that the surgeon arrives in time to do any good; but if he should be

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case in which it was performed unsuccessfully for the relief of stricture by Mr. Watson of New York, and of two cases in which it was performed for the removal of a foreign body, in vols. ii. and iii. of Ranking's Abstract.

* Vide an amusing Clinical Lecture on the abuse of the Stomach-pump, by Professor Watson, in Lond. Med. Gaz. vol. xvii.; and Roupell's Illustrations of the Effects of Poisons.

promptly on the spot, he ought to search the pharynx with his fingers, to ascertain whether the obstruction can be removed; and if not, he ought, to perform laryngotomy immediately; and to pass a probe up into the larynx through the wound, so as to push the foreign substance back into the mouth.

When a foreign substance has passed the *rima glottidis*, and has got into the trachea, it will produce different symptoms according to different circumstances. For, in the first place, it may become impacted in the ventricles of the larynx or upper part of the trachea; in which case it will probably produce violent spasmodic cough and difficulty of breathing, together with a fixed pain referred to one particular spot—a croupy sound during respiration, which may be heard by the stethoscope most distinctly at the seat of that pain; and loss of voice.

In the second place, the foreign substance may be loose in the trachea. In this case, the violent coughing and sense of suffocation produced by its first introduction generally subside for a time; but every now and then there are violent fits of coughing, and of spasmodic difficulty of breathing, during which the substance may be heard by means of the stethoscope, or perhaps may be felt by the finger to be forcibly impelled against the upper part of the larynx.

Thirdly, the foreign substance may have passed into one of the bronchi (generally the right), where perhaps it may be detected by causing a whistling or murmuring sound; and it will very probably be dislodged and driven upwards, when the patient coughs.

It is sometimes difficult to distinguish the symptoms produced by a foreign body in the larynx or trachea from those of croup or laryngitis. But the surgeon may generally pretty confidently decide that a foreign body is present, if the symptoms came on suddenly during a meal; or perhaps the history will be that the patient was playing with a button, or cherrystone, or some similar body in his mouth, and that he chanced to fall down, when the button disappeared, and the symptoms came on directly afterwards. Moreover, in these cases, expiration is generally more difficult than inspiration, whereas it is usually the reverse in croup. Besides, when there suddenly occurs a fixed pain, and a fixed whistling sound in the larynx or bronchi, without any other symptoms of croup, the case must almost of necessity arise from a foreign body.*

Treatment.—When any foreign substance has entered the trachea, if it be moveable, let the patient keep in bed, as quiet as possible, and under the influence of slight narcotics for a few days. Thus possibly the substance may become coated with mucus, and be expectorated spontaneously. Should the symptoms, however, be urgent, recourse must be had to one of the two operations next described.

II. Laryngotomy and Tracheotomy. — The former of these operations is most quickly and easily performed, and is to be preferred in sudden emergencies, but the latter most readily admits of the removal of foreign bodies, and is generally chosen in cases of suffocation from disease.

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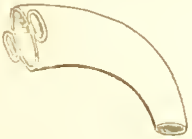
* Vide an interesting paper by Mr. C. Hawkins, and another by Mr. Travers, jun. on this subject, Med. Chir. Trans. vol. xxiii. and a notice of a paper read by Sir B. Brodie on Mr. Brunel's case, Med. Gaz., July 7th, 1843.

Laryngotomy is performed by cutting at once, through the *crico-thyroid* membrane, which may be felt as a soft depression, an inch below the *pomum Adami.*

Tracheotomy is thus performed: The head being thrown back, an incision, an inch and a half to two inches long, must be made exactly in the median line from the cricoid cartilage to the top of the sternum. The skin, superficial fascia, and fat, are then divided; the sternohyoid muscles are separated with the point of the knife; the loose cellular tissue and veins are cleared from the front of the trachea with the fingers or handle of the scalpel; the thyroid gland, if in the way, is pushed up; then the patient being told to swallow, the surgeon seizes the moment, and whilst the trachea is stretched, sticks in his knife, with a slight jerk,* at the bottom of the wound, and carries it upwards, so as to divide three or four of its rings. The operator must take great care to keep in the middle line, and must be very cautious not to cut downwards at the bottom of the wound, for fear of the large veins. Hæmorrhage may be arrested, if arterial, by the ligature; if venous, by nicely adapted pressure; which must be kept up with the point of the fingers if nothing else suffices. As soon as an opening is made, the foreign body is usually expelled with a strong gust of air; but if not, it must be searched for with a probe, and be removed by forceps or by a blunt hook. If there is any difficulty, the plan may be tried, which has recently been practised with success, of turning the patient with his head downwards, in order to let the foreign substance fall through the rima glottidis; and it may be remarked that as soon as an artificial passage is made for the patient to breathe through, the great irritability of the natural aperture subsides, so that it permits the body to pass. The wound may be closed by plaster when bleeding has ceased, but not before.



If the operation were performed for the relief of dyspnœa, a *conical* curved tube should be introduced for the patient to breathe through. From its shape, it fits tightly into the aperture, and prevents the entrance of blood into the trachea. It should be of such a size, as Trousseau has remarked, that the air may pass through it in respiration without any whistling noise.† When the patient wishes to cough or speak, he must be taught to close its orifice with his finger. It should be frequently cleared of any mucus that may lodge in it.

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* The trocar is, as Mr. Fergusson justly observes, a most clumsy and inefficient instrument for opening the trachea; which being an elastic tube, yields and bends before the pressure necessary to introduce the point of it. The author once saw a surgeon fruitlessly endeavour to use it; and he seemed in great danger either of running it through both trachea and œsophagus into the vertebræ, or else of letting it slip sideways into the jugular vein.

† Trousseau de la Trachéotomie, L'Expérience, Nov. 5, 1840.

The operation of opening the larynx or trachea, may be required for various diseases and injuries which cause mechanical impediments to respiration; such as acute laryngitis, croup, chronic laryngitis with ulceration, œdema glottidis, tumours, and some injuries which have crushed the larynx. We have space for a very few observations only on these cases.

III. In acute *laryngitis* and in croup,* where bleeding and other antiphlogistic remedies fail to make any impression on the disease, it is generally agreed upon that tracheotomy should be performed, without waiting till the patient is exhausted by struggling for breath, and his case has become hopeless in consequence. In the state called *œdema glottidis*, in which the submucous tissue about the glottis becomes infiltrated with serum in consequence of a low degree of inflammation, or of a general dropsical diathesis; a glance at the preceding figure will show that an artificial aperture must be often necessary to preserve life. This state may be suspected when intense dyspnœa, not referable to disease in the chest, arises during sore throat, or erysipelas; or when it occurs spontaneously in unhealthy constitutions, without any acute inflammatory symptoms.

IV. In chronic inflammation and ulceration of the larynx, the operation should also be performed before the disease has lasted long enough to exhaust the patient by the spasmodic cough, dyspnœa, and purulent expectoration which attend it. This disease is an occasional consequence of secondary syphilis, as mentioned at p. 196, and more frequently of confirmed phthisis; but the operation should always be performed if there is imminent danger of suffocation, even though the patient's ultimate recovery may be quite hopeless.

V. The operation is sometimes required for tumours or warty excrescences growing within the larynx; cases that will generally be obscure, inasmuch as their symptoms must be nearly the same as those of chronic inflammation, viz. spasmodic cough, dyspnœa, and wheezing respiration.

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* In a case of croup which came under the writer's observation some years since, the patient being manifestly *in articulo mortis*, tracheotomy was performed by Mr. Mayo, and a large piece of false membrane was extracted; after which the child lived four days, and had every prospect of recovery, but was suddenly carried off by convulsions. This case is mentioned to justify the recommendation to perform tracheotomy in croup; a thing which some surgeons altogether condemn.

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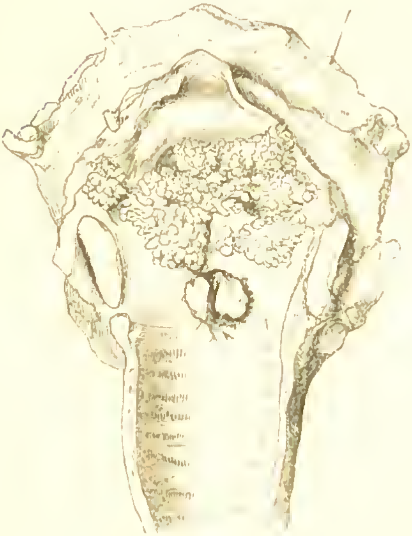

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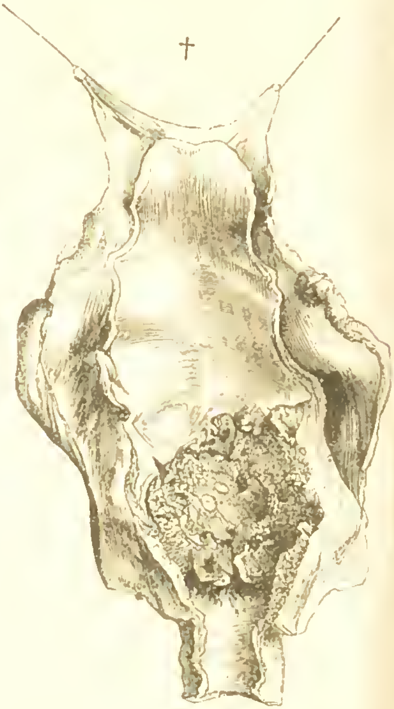

VI. A Polypus growing from the Epiglottis has been known to produce fits of suffocative spasm of the muscles of the glottis, which proved fatal.‡ Any such tumour, if ascertained to exist by examining with the finger, must be removed if possible. A case is on record also of a polypous tumour growing in the trachea; the diagnosis of such a case from chronic inflammation or thickening, must be very difficult.§

VII. Cases that simulate Laryngeal Disease.—Some years since the medical journals made themselves merry at the expense of the house-surgeon to one of the largest hospitals in London, who being summoned in the night to a patient apparently dying of dyspnœa, immediately performed tracheotomy, but without avail; for the man

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* Warty excrescences within the larynx. Laryngotomy had been performed. From the Middlesex Hospital Museum.

† Ulceration of the larynx.

‡ Vide case published by Mr. Stallard, Med. Gaz. 19th May 1843.

§ There is a preparation exhibiting this in the King's College Museum, from Mr. Mayo's collection.

expired very soon afterwards; and on a *post mortem* examination it was found that there was nothing the matter with the larynx, but that a large aneurism existed on the arch of the aorta. What was the use, it was justly said, of cutting the throat of a man who was dying of aneurism? The house-surgeon, however, was not so entirely to blame, as he was then considered, because, as is now very well known, tumours about the aortic arch may produce spasm of the glottis, by irritating the recurrent nerves. But now that this fact is known, every surgeon should carefully scrutinise the chest, in obscure cases of dyspnœa, to see whether it arise from this cause, because if it does, no good can be gained by any operation. The same may be said of that spasm of the glottis, which often affects children during their teething; and of cases in which the symptoms of laryngitis are mimicked by hysteria.*

VIII. Scalds of the Glottis, through swallowing boiling water or corrosive fluids, produce the ordinary symptoms of laryngitis—suffocative cough, and dyspnœa.

Treatment.—Leeches, ice to the throat, calomel in large doses, so as rapidly to affect the system, and tracheotomy if required.

IX. Hanging may destroy life in three ways. 1. By dislocating the neck. 2. By compressing the trachea, and suspending respiration. 3. By compressing the jugular veins, and inducing apoplexy.

Treatment.—Artificial respiration, bleeding from the jugular vein if the face be turgid, dashing cold water on the face and chest, and a current of galvanism passed from the nape of the neck to the pit of the stomach, so as to excite the diaphragm.†

X. Drowning, *Treatment of.*—If respiration has ceased, it should instantly be commenced artificially; at the same time the body should be wiped dry, and be assiduously rubbed with hot cloths. Hot bricks and bottles of hot water should be put into the axillæ, between the thighs, and to the feet; the head should be raised, the nostrils irritated with a feather, or with the fumes of hartshorn, and a warm enema of turpentine may be thrown up. Galvanism should be resorted to, if respiration is not quickly restored. It need scarcely be said that enemata of that filthy narcotic, tobacco, must not be thought of. As soon as the patient can swallow, he should have some weak wine and water; and soon afterwards an emetic of mustard, to clear the stomach of the water which he has swallowed, and to restore the circulation by the impetus of vomiting. After some hours he will suffer from severe headache and fever, which must be relieved by bleeding or leeching, purgatives, and other remedies, according to the exigencies of the case. A case is related in which life was restored by the most persevering friction, which was kept up for eight hours before the humanity of the surgeon, Dr. Douglass of Havre, was rewarded by a return of respiration.*

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* Many very valuable observations on these points will be found in Dr. Watson's Lectures on the Practice of Physic.

† For the manner of applying galvanism in these cases refer to Part V. Chap. II.

XI. Artificial Respiration is required in all cases of suspended animation, whether from drowning, external injury, noxious gases, or narcotic poisons. It may be performed by passing a pipe through the mouth, or a male catheter through the nostril, into the glottis ; or by simply putting a pipe into one nostril, and closing the mouth and the other nostril, and blowing through it. But it is a better plan to use a small pair of bellows, putting its muzzle into one nostril. The operator should be careful to force the air into the lungs with very great gentleness, and to press the larynx against the spine, so that it may not go down the œsophagus. If the larynx has been crushed by a rope, or by a violent blow, it may be necessary to perform tracheotomy, so as to impel a current of air directly into the trachea, but not otherwise.

SECTION IV.—SURGICAL AFFECTIONS OF THE EXTERNAL PARTS OF THE NECK AND THROAT.

I. Wounds of the Throat are generally made with intention of suicide, and are extremely dangerous, no less from the importance of the parts injured, than from the despondency of the patient.

Treatment.—The general indications are, 1st, to arrest hæmorrhage; 2ndly, to obviate difficulty of breathing; 3rdly, to prevent inflammation of the trachea or chest.

In the first place, any arteries that are wounded must be tied, and hæmorrhage from large veins must be restrained by pressure with the finger, kept up as long as may be necessary. The patient should be put to bed in rather a warm room ; and as soon as all oozing has ceased, but not before, his shoulders should be raised by pillows, and the head be bent forwards, and be confined by a bandage passing from each side of the nightcap to the shoulders. Plasters are inadmissible, and so are sutures, except in the cases that will be alluded to presently. If the wound penetrates the trachea or larynx, it should be covered with a loose woollen comforter, or, after the first week, with one of Jeffrey's respirators, if it can be nicely adapted. The patient should not be kept too low; and if the pharynx or œsophagus is wounded, a common, large-sized, elastic catheter may be passed, through which nutritive fluids can be injected by means of an elastic bottle. But if during the inflammatory stage the attempt causes great irritation, it may be necessary to employ nutrient enemata merely. At all events, no tubes should be passed through the wound for that purpose. The great thirst and dryness of the fauces, experienced in these cases, may in some measure be mitigated by sucking a wet rag. If the patient finds great difficulty in expectorating through the wound, he must be taught to close it partially by leaning his head forwards, and placing his fingers on it, whilst he makes an expiratory effort, so that he may expel the air with a sudden gust.

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* Med. Gaz. 23rd December, 1846.

In every stage of the cure, difficulty of breathing should be viewed with suspicion. It may arise from several causes. 1. If the wound is above the larynx, it may be caused by the epiglottis being detached from the tongue, and hanging down upon or irritating the *rima glottidis*, or by clots of blood collecting in the pharynx. 2. It may be caused by an irregular and jagged division of the larynx or trachea, so that some pieces of the cartilage hang into the tube; or supposing the trachea to have been completely cut through, it may be caused by the aperture of the lower portion being overlapped by the upper. In these cases it may be requisite to employ sutures, but they should be passed merely through the cellular tissue around the cartilage, and neither through the cartilage nor the skin. 3. It may be caused by swelling of the mucous membrane of the larynx and trachea in the acute inflammatory stage immediately after the injury; or by chronic thickening of that membrane from the continued irritation of cold air, if the wound is very slow in closing. In the former of these cases, free antiphlogistic measures must be used; the latter must be prevented by using a proper position, so as to promote the approximation of the wound whilst it is healing. In either case it may be necessary to make a longitudinal division of the trachea to relieve the dyspnœa. 4. Another frequent cause of dyspnœa is the passage of blood into the trachea, if the wound is prematurely closed, and especially if it is sewn up or covered with plasters. Even supposing the trachea not to be opened, great danger may result from closing a wound of the throat before bleeding has ceased, for the blood may accumulate in the cellular tissue, and coagulate, and compress the trachea.

II. BRONCHOCELE (*Goître*, *Derbyshire neck*) signifies an hypertrophy of the thyroid gland.

Symptoms.—A soft, projecting, elastic tumour occupies the front of the neck, in the situation and of the shape of the thyroid gland. It is rarely tender, and the skin is not discoloured. Frequently one lateral lobe is larger than the other; and occasionally the middle lobe or isthmus is solely or principally affected.

Consequences.—When of moderate bulk, it rarely causes any inconvenience, except occasional headache, and difficulty of breathing in a stooping posture. But when very large, it may produce a most dangerous difficulty of swallowing and breathing, and congestion in the head by its pressure on the trachea, œsophagus, and jugular veins;* or it may induce thickening and disease of the trachea, with most obstinate cough, which may end in consumption.

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* Mr. Howship gives a case of bronchocele with the jugular vein passing through its substance. The patient suffered greatly from congestion in the head.

Diagnosis. — It is to be distinguished from encysted and other tumours by its shape, by its want of fluctuation, and by its mostly affecting both sides.

Prognosis.—If it be soft and recent, and occur in a young patient, it will most likely be cured; but probably not if it be old, hard, and the patient advanced in life.

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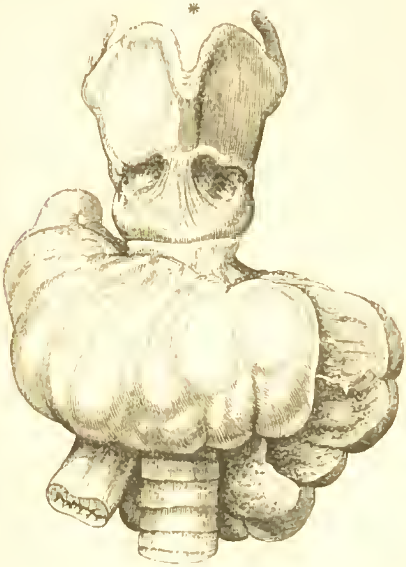
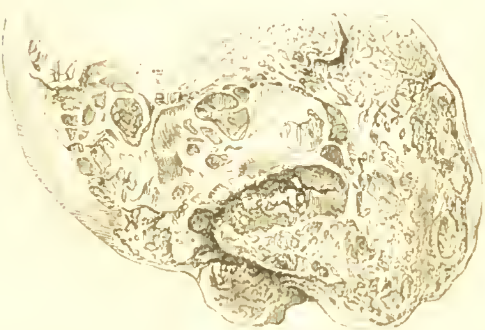


Anatomical Characters.—The cells of the gland are found enlarged; of various sizes, from that of a pea downwards; and filled with a viscid fluid, which becomes gelatinous if immersed in alcohol. Hence it has been presumed that the disease consists essentially of an increased secretion of the matter contained in the cells of the gland. Sometimes they are filled with blood. In old cases, the tumour becomes hard, and may contain earthy deposits, as shown in the next cut.†



Causes.—Bronchocele is what is termed an *endemic* disease: that is, one extremely prevalent in certain localities; amongst which may be mentioned Derbyshire, Nottingham, and the chalky parts of England generally; and various Alpine and mountainous districts, especially the Tyrol and valley of the Rhone. The use of melted snow or of water impregnated with calcareous or earthy particles, to which the inhabitants of all those places are more or less habituated, although not perhaps the invariable cause, is the most probable that can be assigned.* In England it most frequently affects females about the age of puberty, and in many cases is obviously connected with uterine derangement. Patients so often refer its origin to some twist or strain of the neck, that there is some reason for believing that such an accident may be an exciting cause. There are some persons who always have more or less enlargement of the thyroid gland, and who invariably find it increase in bulk when their health is out of order, or their strength lowered.

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* From the King's College collection. The œsophagus is seen to be pushed to the right side by the tumour.

† Vide Baillie's Morbid Anatomy, by Wardrop, 2nd ed. p. 84, and Turner's Art of Surgery, vol. i. p. 198. The second cut exhibits a preparation in the Middlesex Hospital Museum.

Treatment.—The best remedy for this disease is iodine. The dose should not be large enough to cause pain or disorder of the stomach, or any diminution of the general health. The tincture of pure iodine is objectionable, because it is not miscible with water, and is apt to cause pain in the side. But the iodine should be combined with an alkali, or with the iodide of potassium, or with iron; and an aromatic or a little hyoscyamus often makes it sit more lightly on the stomach. (F. 88.) Before administering the iodine, however, it is useful, if the complaint is of recent origin, to apply leeches, and purge the patient freely. An ointment or liniment of iodine, or of the iodide of potassium, may also be rubbed into the tumour; but it must be remembered that the swelling generally enlarges, instead of decreasing, if the skin be irritated. The patient, if possible, should remove from a district in which the malady is prevalent, and should drink boiled or distilled water. A residence on the coast, and warm sea-bathing, are mostly advantageous. If the iodine does not succeed, the burnt sponge, in doses of ʒß. ter die, is the best substitute. Any disorder in the digestive or uterine organs should be carefully removed. Pills composed of aloes, soap, and asafœtida (āā gr. ii.—iii.) may be given at bedtime with advantage. Other remedies which were in vogue before the discovery of iodine, and which may be resorted to if that fails, are as follows: mercury, iron; potass and soda; chlorides of barium and calcium; digitalis, hyoscyamus, and belladonna; and sea-water.

If medicines prove ineffectual, and the tumour enlarges rapidly, so as to threaten suffocation or apoplexy, surgical operations must be resorted to. There are three which have been proposed and practised:—viz. the introduction of setons; ligature of the arteries which supply the gland; and extirpation. The general results of these operations may be stated thus: All three of them have at different times succeeded; all of them are hazardous to life, and have proved fatal; and the first two have, in some instances, failed to remove the disease, although the patient has recovered with his life.

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* Capt. Alexander Gerard, in his account of Korrawur in the Himmalayas says, that "although the Korrawurrees can get nothing but snow for some months in the year, they are not so subject to goitres as the people that live in the damp grounds in the forest at the foot of the hills, where there can never be any snow water."

If a *seton* be passed, it should be of silk, and large enough to fill the wound made by the needle, so that there may be no fear of bleeding. The needle should be long and narrow. The utmost precaution must be taken, both before and after the operation, to avoid inflammation. If after the seton has remained for some time, it ceases to produce a diminution of the gland, it should be withdrawn, and be re-introduced in another place.

Extirpation of the gland is performed by making an incision in the mesial line of the neck; the skin and muscles must then be dissected from the tumour; and every artery be tied as soon as it is divided. Then (as it is mostly enlargement of the isthmus, or middle lobe, that requires this operation) a strong double ligature should be passed through it, and should be firmly tied on each side of it, before it is cut out.

Encysted Tumours.—Sometimes *cysts* are formed in this gland, which contain a glairy matter or blood. If necessary, they may be punctured, when they will most likely inflame, suppurate, and contract. If bleeding prove troublesome, the wound must be filled with lint. Similar cysts are liable to form in other parts of the neck, and not connected with the thyroid gland. Their treatment is the same.*

This gland may further be affected with acute and chronic *inflammation*, and tubercular deposit; either of which may lead to abscess. Their *treatment* must be conducted on general principles.

It has also been affected with scirrhus, although rarely. Some cases of it are recorded in the Med. Chir. Trans. vol. xxvii. by Mr. Cæsar Hawkins, and by Mr. Brown of Bath. The patients presented solid tumours in the situation of the gland, not having the characters of ordinary bronchocele, and one distinctive feature was the fixity of the parts.

III. HERNIA BRONCHALIS (*Bronchocele vera*, *Goître aerien*) is a very rare tumour, formed by a protrusion of the mucous membrane through the cartilages of the larynx, or the rings of the trachea, and caused by violent exertions of the voice. Larrey met with sundry instances of it in French officers, and in the muezzin or priests that call the people to prayer from the top of the minarets in Mohammedan countries. The tumour is soft and elastic, can often be made to disappear by pressure, and is increased by any exertion. The only available treatment is moderate support.†

IV. PAROTID TUMOURS. — The parotid gland is occasionally, although rarely, the seat of malignant disease, and perhaps of sarcomatous enlargement. But the tumours behind the ramus of the jaw, commonly called *parotid tumours*, generally depend on disease of the lymphatic glands, which are embedded in the parotid. These, by their increase, may cause the natural texture of the latter to be absorbed, and may extend inwards to the pterygoid and styloid processes, and be intimately connected with the branches of the *portio dura*. "If there be reason to suspect," says Mr. Liston, "that the disease is of a malignant nature, and not thoroughly limited by a cellular cyst, no interference is admissible. If, on the contrary, it be at all moveable, has advanced slowly, possesses a smooth surface, and is firm (neither of stony hardness, nor pulpy), then an operation may be contemplated."

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* Vide a paper by Mr. B. Phillips in Med. Chir. Trans. vol. xxv. on Tumours in the neck not involving the Thyroid Gland.

† Larrey, Clinique Chirurgicale, tom. ii. p. 81. Paris, 1829.

V. TUMOURS IN THE SIDE OF THE NECK, arising from enlargement of the lymphatic glands, if subjacent to the skin merely, and freely moveable on the subjacent tissues, may be readily removed, but if they lie deep, and are bound down by the platysma and fascia, they require some consideration. If a tumour be of slow growth, defined in its outline, and moveable, so that it is probably not malignant, or if it interferes with deglutition or respiration, its extirpation may be attempted. The patient should always be warned of the probability of facial palsy after removal of a parotid tumour. See the remarks on the removal of tumours in Part V.

VI. WRYNECK is a peculiar distortion in which the head is bent down towards one shoulder (generally the right), and the face is turned to the opposite. The right eyebrow and right corner of the mouth generally become elevated, so as to preserve their horizontal position, notwithstanding the distortion of the neck.

Varieties.—This affection presents many varieties. It may perhaps be only a part of general lateral curvature of the spine. Or, 2, it may depend on caries of the cervical vertebræ. 3. It may be caused by contraction of the cicatrix of a burn or ulcer. Or, 4, by glandular enlargement on one side of the neck; the treatment of which cases requires no observation in this place.

But the genuine wryneck is produced by permanent contraction of one sterno-mastoid muscle, which may depend, 1. on *inflammatory spasm* of that muscle, with or without sub-acute inflammation of the cervical fascia. This form generally occurs somewhat suddenly to weakly children with disordered digestive organs. The skin over the muscle is often hot and tender, and any motion causes pain.

Treatment.—Perfect rest in the horizontal posture, leeches, and poultices, or hot fomentations, so as to keep the skin constantly moist and perspirable, with purgatives and alteratives, followed by quinine.*

2. It may depend on *rigid atrophy* of the muscle, which may be a sequel of the state of inflammatory spasm last described, or may be congenital.

Treatment.—Long-continued friction with mercurial ointment, or with lin. hydrargyri, or Scott's ointment (F. 160) worn as a plaster, with blisters behind the ears, and to the nape of the neck, and the use of a machine to keep up extension,† may be of service in cases that are of no very long duration. If they fail, or if the case is congenital, division of the sternal origin of the muscle (or perhaps of the clavicular also) is the last resource. It is best performed thus:—The skin covering the muscle at about an inch from the sternum is to be pinched up between the left fore-finger and thumb. A narrow curved bistoury is then to be thrust under the muscle, and is to be made to divide it as it is being withdrawn; but the wound in the skin must only be large enough to admit the instrument. The aperture may be made at the anterior border of the right muscle, and between the sternal and clavicular portions of the left. As soon as the division is complete, the ends of the muscle retract with a dull snap, and the thumb should be pressed on the part, to prevent effusion of blood under the skin. When the wound is healed, but not before, an apparatus should be applied to elongate the callus, and restore the neck to its proper position. A stiff collar to the diseased side is the simplest and best apparatus.

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* For further information respecting this form of wryneck, consult Abernethy, Lecture xxxii., Renshaw's ed.; Jameson Inflammation, 2nd ed. p. 484; Brodie on Local Nervous Affections; and Coley, Med. Gaz. N. S. vol. iv. p. 148.

† See a plate in Cooper's First Lines.

3. Lastly, this distortion may be caused by *palsy* of one sterno-mastoid muscle, in consequence of which, the other muscle, being uncontrolled, drags the neck permanently to its own side. If the administration of remedies calculated to remove any existing disease in the head or back, and to improve the health, and if strychnine, blisters, issues, and electricity fail, division of the sound muscle has been recommended.*

CHAPTER XVI.

OF THE SURGICAL DISEASES AND INJURIES OF THE CHEST.

I. PNEUMOTHORAX signifies a distention of the cavity of the pleura with air, and collapse of the lung. It is known by the following symptoms: On the affected side there is an absence of the respiratory murmur, with an exceedingly clear sound on percussion, and immobility of the ribs; and there is *puerile respiration* on the other side. It may be caused, 1, by a fractured rib which has lacerated the lung—and in this case it is attended with emphysema, as has been detailed at page 247. 2. It may be caused by the bursting of an abscess of the lung into the cavity of the pleura. This case will be indicated by *succussion*, and by *metallic tinkling*, in addition to the signs mentioned above. *Succussion* simply consists in making the patient shake himself, when (inasmuch as both air and fluid have escaped from the lung into the pleural cavity) the fluid will be heard to splash, if the ear is applied to the chest. The *metallic tinkling* is a clear sound, like the dropping of water into a cask. It is produced when the patient coughs, by which means a drop of fluid is shaken from the orifice in the lung, and made to fall to the bottom of the chest.

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* Vide Cases of Wryneck, &c. by Dieffenbach, in the Lancet for Sept. 1838. Gooch gives a case of wryneck and distortion of the jaw caused by contraction of the platysma myoides, and cured by division of that muscle, in the year 1759.

Treatment. — As far as the mere surgical treatment of pneumothorax is concerned, if the breathing become very difficult, a grooved needle, or small exploring trocar, may be introduced between the fifth and sixth ribs, to let the air escape.

II. HÆMOTHORAX, which signifies the presence of blood in the pleural cavity, may be suspected if great dyspnœa and dulness on percussion follow a fractured rib. The blood may proceed either from the intercostal artery, or from the lung.

Treatment.— If the difficulty of breathing be very urgent, *paracentesis* must be performed, to let the blood escape.

III. HYDROTHORAX, or water on the chest, is indicated by great difficulty of breathing, especially when lying down—livid countenance—disturbed sleep—dulness on percussion—and if the effusion be confined to one side of the chest, there is very great difficulty in lying upon the other.

Treatment.—If the hydrothorax were merely an inflammatory effusion from pleurisy, a local affection, *paracentesis* might be advisable for the dyspnœa; but if (as it is generally) it is an effect of organic disease of the heart or lungs, the operation would do no good. At all events, both sides of the chest must not be punctured.

It has been suggested to the author by Dr. Ferguson, that it might be advantageous to employ the needle for the cure of serous effusion into the pleura, in the same manner as it is employed for the cure of hydrocele and ganglion. That is to say, half a dozen punctures might be made with an acupuncture needle or grooved needle through one of the intercostal spaces; and thus the serum might pass through the punctures into the cellular tissue outside the pleura, whence it might be absorbed. The same plan might also be adopted in cases of hydrops pericardii and ascites.

IV. EMPYEMA signifies abscess of the chest, or suppuration of the pleura. It is an effect of acute inflammation, whether idiopathic or caused by injury. It is known by dulness on percussion, gradually increasing enlargement of the side of the chest—separation of the ribs—dyspnœa—difficulty of lying on the sound side—and more or less œdema of the parietes of the chest. If left to itself, the abscess may point and burst between the ribs. *Paracentesis* is decidedly required, if the case be clear; if it be not, two or three punctures may be made with a grooved needle, or a small exploring trocar, and a cupping-glass be applied over them to extract some fluid.

V. PARACENTESIS THORACIS, or puncture of the chest, is an operation sometimes required for the foregoing affections, and especially for empyema, and may be performed by making an incision an inch and a half long, between the fourth and fifth or fifth and sixth ribs, at or a little behind their middle. The intercostal muscles are then to be cautiously divided, and the point of the bistoury to be passed through the pleura. If fluid escapes from this puncture, a trocar may be plunged in. When performed for the relief of empyema, this operation is liable to be followed by many of the mischiefs that result from the opening of large chronic abscesses. The pleural cavity is incapable of contracting as the pus escapes; air consequently enters to supply its place, and causes irritation of the cyst, and putrefaction of its contents. The discharge becomes profuse and fetid, and the patient suffers severely from irritative fever, under which he may sink. It is, therefore, advisable to place the patient on the diseased side immediately after the puncture, so that the matter may flow out without the ingress of air—to close the wound with lint and plaster before too much has escaped, to press the abdominal viscera upwards whilst the fluid is escaping, to bandage the chest afterwards, and to repeat the operation in a few days, if necessary, instead of leaving the wound open.

VI. HYDROPS PERICARDII may occur under the same pathological conditions as hydrothorax, and may be combined with it. Its diagnosis is obscure. It may be suspected to exist if the patient complain of constant weight in the præcordia, great dyspnœa, especially when lying on the back, and faintness upon exertion; if there is great dulness on percussion, and manifest fulness over the region of the heart—if its pulsations are tremulous—and the circulation embarrassed. The operation of *paracentesis pericardii* has been practised, although it can rarely be of much benefit. It has been attempted in sundry cases of hydrothorax, which were mistaken for hydrops pericardii; but by a second lucky mistake the pleura was opened instead. It may (if thought advisable) be performed, either by making an incision opposite the heart's apex, and dividing the muscles and pericardium with the same precautions as in paracentesis thoracis—or by first making an opening into the pleura, opposite the junction of the fifth or sixth rib with its cartilage—and then introducing the finger, feeling for the distended pericardium, and cutting into it with curved scissors.

VII. WOUNDS AND CONTUSIONS OF THE PARIETES of the chest require the same treatment, whether the ribs are fractured or not. A firm bandage (having an aperture to admit of the dressing of any wounds) must be applied to prevent motion of the ribs. Free venæsection must be employed to prevent inflammation; the bowels must be opened, the diet low, and cough and irritation be allayed by opiates.

VIII. PENETRATING WOUNDS of the thorax, unattended with wound of the lungs, are exceedingly rare. In some cases when the chest is laid open, the lung collapses, just as it would in a dead body; in others, on the contrary, it does not recede from, or it even may protrude out of the wound.

Treatment.—Bleeding must be restrained; foreign bodies and splinters of bone must be removed, and the wound be closed; then the surgeon must employ free bleeding, and the other measures spoken of above. The *intercostal artery*, if wounded, must, if possible, be tied, with a curved needle or tenaculum, the wound being enlarged for that purpose if necessary. If this cannot be done, pressure must be kept up on the bleeding orifice by the finger. If the lung protrudes, the rule generally given is, to return it as quickly as possible, unless it is injured or beginning to mortify; but Mr. Guthrie recommends that it should be permitted to remain, as it closes the aperture into the pleura, and speedily granulates and heals over.

IX. WOUNDS OF THE LUNG are known by the following symptoms: Great dyspnœa and sense of suffocation; the countenance pallid and extremely anxious—and expectoration of blood, which is coughed up in florid arterial mouthfuls, mixed with occasional clots. The dangers of these wounds are threefold. 1st. The great *hæmorrhage*, which may destroy the patient by exhaustion, or may fill up the air passages and induce suffocation. 2ndly. *Inflammation*, which is sure to supervene from the injury, and may be aggravated by the irritation of clots of blood, or of other extraneous bodies. 3rdly. Profuse and exhausting *suppuration*, with cough, debility, hectic, and all the symptoms of phthisis.

Prognosis.—This of course must be extremely guarded. But there may be good hopes of recovery after the third day is passed. Death is seldom caused after the first forty hours.

Treatment.—The first indication is to check the hæmorrhage. This can only be done by abstracting a large quantity of blood from the arm, provided the patient be not already faint, and by the free administration of opium. Then the wound should be examined, and if it be of large size, or a gunshot wound, the finger should be introduced into it, to remove clots of blood, splinters of bone, or any other foreign substances that it may find. If it is not sufficiently large for this purpose, it may be dilated by a probe-pointed bistoury. At the same time, an intercostal artery, if wounded, should be secured. The wound should then be accurately closed with lint and plaster, and the patient should be suffered to lie as quiet as possible. He should have plenty of cool air, and a very light covering. It is a general rule, in all injuries of the thorax and abdomen, to place him on the wounded side. If in the course of a few hours, in spite of the opium, the pulse rises and the pain, and cough, and spitting of blood return, venæsection must be repeated. The diet must be rigorously low; nothing but iced lemonade, barleywater, or milk and water can be allowed for several days; the bowels must be opened, and opiates be given to allay cough and pain.

Secondary hæmorrhage, after wounds of the lung, may, 1, be caused by inflammatory excitement; or, 2, (if the wound be gunshot) by the separation of sloughs from the lung; or, 3, by the sloughing of an intercostal artery that may have been brushed by the ball. Venæsection is the remedy for the first two cases, and the ligature, or pressure, for the third.

If, after the primary dangers of hæmorrhage and inflammation have ceased, and the wound has closed, there are rigors, dyspnœa, and other signs of *empyema*, *paracentesis* is requisite. And if these symptoms come on soon after the injury, the paracentesis should be performed at the site of the wound; but if they come on at a distant period, the paracentesis should be done at the usual place, in order to avoid the adhesions that are sure to be formed near the wound.

Foreign bodies in the chest add greatly to the danger of exhausting suppuration, although patients have recovered for years with balls, or pieces of cloth, encysted in the lung or pleural cavity. In some cases, a ball has remained rolling loosely about in the pleural cavity. If any foreign body is detected, it should, if possible, be removed, and part of the upper border of a rib may be sawn away with Hey's saw, if necessary, in order to get at it.

Some surgeons direct penetrating wounds of the chest not to be closed; or they even recommend tents or canulæ to be inserted, to provide for the escape of blood or matter. But it must be evident that there will be much less liability to severe inflammation if the wound is closed, just as in wounds of joints and compound fractures. Besides, "if the patient," says Hennen, "is placed with the wound in a dependent posture, the exit of effused fluids is not necessarily impeded. If they exist in large quantity, the wound is effectually prevented from closing; if the flow is so minute as to admit of the union of the wound, the quantity effused is within the power of the absorbents to remove."

After wounds of the chest, there is a constant susceptibility of inflammation from slight causes, so that the patient should be cautious to avoid over-fatigue, intemperance, and atmospheric vicissitudes.

X. ABSCESS behind the sternum, and caries of that bone sometimes require a perforation to be made in it with a trephine.*

XI. WOUNDS OF THE HEART generally prove fatal from hæmorrhage. Numerous instances, however, are on record, in which stabs or musket wounds of this organ healed, both in man and animals, without any ill effects remaining. The diagnosis and prognosis will of course be extremely doubtful. The only available *treatment* is free depletion and opiates, in order to prevent hæmorrhage, and keep the circulation as quiet as possible, so that the blood may coagulate in the wound, and the coagulum become adherent and organized.

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* For cases, references, &c., see G. Borlase Childs, Lancet, 24th Aug. 1850; Cæsar Hawkins, Med. Gaz. N. S. vol. v. p. 62.

CHAPTER XVII.

OF THE SURGICAL DISEASES AND INJURIES OF THE ABDOMEN.

I. Paracentesis Abdominis is an operation performed in *ascites* and *ovarian dropsy*, when the abdomen has become so distended that the breathing and the circulation of the lower extremities are seriously impeded.

Diagnosis.—*Ascites* is known by the abdomen being *equably* enlarged and fluctuating, not feeling harder at one part than at another, whilst in *ovarian dropsy*, the swelling fluctuates less distinctly, and is evidently composed of distinct cysts, some of which feel more distended than others. A second means of distinguishing the two affections is afforded by percussion. In ascites, the bowels, as they contain air, float up through the serum ; and, in whatever position the patient may be placed, they tend to occupy the uppermost part, and the serum the lowest ; and a clear sound may be elicited by percussion over the bowels, but a dull sound over the serum. Thus, if the patient be placed on his back, a clear sound will be produced over the anterior surface of the abdominal parietes, but a dull sound towards the sides and back. In ovarian dropsy, on the contrary, the abdomen is distended by a tumour which occupies its front part, the bowels being behind and on either side of it. Consequently, when the patient lies on her back, percussion of the anterior surface produces a dull sound ; whilst a clear sound may be produced towards the back part and sides. In doubtful cases a puncture may be made with a small trocar, to examine the fluid that issues ; which, in ascites is a clear serum, but in ovarian dropsy displays under the miscroscope numerous small granules and cells.*

Operation.—The patient must be seated in a chair. A broad towel must then be passed round the lower part of the abdomen, and its ends be crossed behind and entrusted to two assistants, who are to be instructed to draw it tight and support the belly as the fluid escapes ; otherwise, the removal of the compression to which the abdominal veins have been habituated would cause the blood to gravitate into them from the heart, and induce syncope, or perhaps they might burst, and occasion a fatal hæmorrhage. A piece of flannel broad enough to cover the whole abdomen, and having a notch cut out of it above and below (and the edges sewn together afterwards), is a good substitude for the towel. The surgeon then holding a trocar in a canula in his right hand, with the end of his forefinger about two inches from the point of the instrument, plunges it through the linea alba, two inches below the umbilicus, then steadying the canula with his left hand, he pulls out the trocar with his right ; the fluid, of course, is to be received into a proper vessel, and the assistants to draw the towel tight as it escapes. If the trocar is a large one, it will be as well to puncture the skin with a common lancet before introducing it. The aperture is afterwards to be closed with lint and plaster, and the patient to be put to bed, with the towel fastened round the loins. A broad flannel roller should be substituted for it before he rises. If a patient with ascites happens also to have an old irreducible hernia, and the sac is much distended, and preserves a free communication with the abdomen, it is a good plan to puncture the sac instead of the linea-alba.

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* Bennett, Edin. Med. and Surg. Journal, April, 1846.

II. OVARIOTOMY.—Ovarian dropsy consists in the conversion of the ovary into a large tumour, containing one or many cysts, filled with a serous or glairy fluid, and mixed with more or less solid matter. The cysts may vary in number, from one to a great many; and in size from that of a pea, to that of the biggest pumpkin. They may be thin and flexible like bladder, or thick and semicartilaginous. The contained fluid is generally glairy like white of egg, and contains about eighteen grains of albumen to the ounce; but it may be clear and transparent as pure water, or thick and almost semisolid. The ovarian tumour not uncommonly contains more or less of malignant growth.

The ordinary course of this disease is, that it continues to increase; it fills up the abdomen; interferes with the breathing, makes the patient's existence a misery, and at last wears her out from pain and irritation. The question then is, what can our art do to cure the patient, or to mitigate her sufferings; and there are three things that require mention, viz., 1stly, tapping; 2ndly, various medical and surgical measures adopted in the hope of producing atrophy; and 3rdly, ovariotomy.

1. *Paracentesis.*—This is the simplest mode of procuring relief; but it is necessarily an incomplete, and often a dangerous one. Cases are extant, it is true, in one of which the patient lived to be tapped sixty-six times at intervals of about a month; and in another 128 times at intervals of six weeks; but taken as a general rule it may be affirmed that few patients survive more than four years after the first tapping, a period passed in the greatest misery and suffering; so that this operation cannot be said to be worth much even as a palliative. We may add, that in order to relieve the patient effectually, it may be necessary to use a very long trocar, and to plunge it quite deeply, so as to reach the more deeply-seated cysts; and that the puncture had better be made wherever fluctuation is most evident. Tapping *per vaginam*, when a fluctuating portion of tumour projects much in that situation, may be worth adopting.

2. Under our second head may be enumerated an immense variety of plans for producing atrophy or absorption of the tumour; such as (*a*) the administration of iodine and its preparations taken internally and by friction; of mercury, and other so-called deobstruent medicines (regarding which the author firmly believes that the less medicine the

patient takes, the longer she is likely to live); (*b*) operations for opening the cyst into the cavity of the peritonæum by subcutaneous section, thus imitating the cases in which the cyst has been ruptured by violent action of the abdominal muscles, and the fluid has been absorbed and the patient cured. But of course, for the success of such operations, it stands to reason that the active growth of the tumour must be at an end. (*c*) Operations for causing the tumour to waste and suppurate, or for draining away its contents, by tapping and injecting as in hydrocele; or passing setons; or procuring adhesion of the cyst to the abdominal parietes, and establishing an ulcerated opening into the cyst at the adherent spot; or cutting into the cyst, and stitching the edges of the opening into it to those of the wound through the abdominal parietes; lastly, Mr. I. B. Brown's plan of salivation, tapping, and pressure.

3. *Ovariotomy.*—The remaining remedy then is extirpation. Against which may be adduced, 1st, the extreme difficulty of diagnosis, insomuch that out of eighty-one cases collected by Mr. B. Phillips in 1844, in which it has been attempted, no tumour whatever was found in five, and in six others the tumour was not ovarian; 2ndly, the fact that in fifteen out of the eighty-one cases, after the abdomen was opened, extirpation of the tumour was found impracticable, in consequence of the numerous adhesions which bound it to neighbouring parts;* 3rdly, the mortality. Of the eighty-one cases, forty-nine recovered, thirty-two died. Of the sixty-one in which the tumour was extracted, thirty-five recovered, twenty-six died. Of the fifteen in which the tumour could not be extracted, nine recovered, and six died. On the other hand, in favour of the operation it may be argued; 1st, that the mortality arising from this is not larger than that from many other surgical operations;† 2ndly, that no other plan of treatment can effect a radical cure; 3rdly, that if favourable cases only were submitted to operation, the mortality would be very small, and that increase of experience will lead to the selection and discrimination of favourable cases; and lastly, that it is by far the *most merciful* plan of treatment, if adopted early, in

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* Out of four patients operated on by Mr. Lizars some years ago, one died; one recovered; in one, after the abdomen was laid open, there was found to be no tumour at all; and in the fourth there was discovered an enormous mass of convoluted vessels looking like a placenta, which proceeded from the omentum to the tumour, and of course rendered extirpation quite out of the question, so that the incision was quietly closed again.

† Mr. Solly in a Lecture in the Med. Gaz. vol. xxxviii. states that the deaths from ovariotomy up to 1846 were only one in three and a half. Dr. Tilt, Lancet, 1848, vol. ii. p. 626, gives sixty-one cases, which occurred in the practice of five individuals. Of these, it was impossible to remove the tumour in eleven, of which eleven, seven recovered and four died. Of fifty cases in which the ovary was removed, thirty-seven recovered and thirteen died. But the statistics of the operation, including successful and unsuccessful cases, are yet wanting. We occasionally hear of an abdomen being laid open, and sewn up again, with a tumour impossible to remove, but these cases are not published so eagerly as more successful ones are.

patients otherwise healthy, with a still growing, but non-adherent tumour.

The surgeon who determines to extirpate a diseased ovary, should ascertain that the general health is such as would be desired in any patient who was to undergo a capital operation ; he should carefully estimate the size of the tumour ; the amount of solid matter it contains, as indicated by more or less perfect fluctuation over its surface, and in particular should endeavour to estimate whether it adheres to the abdominal parietes or viscera. This he may do in some measure by noticing whether it shifts its place as the patient rolls herself from side to side ; and also by a very ingenious test which the author has seen used by Dr. F. Bird ; namely, by putting the abdominal muscles in action, and noticing whether they rise much from the surface of the tumour. Thus, if the patient whilst lying on her back be told to raise herself up in bed without using her arms, the recti muscles will start up into a prominent band if their sheath is *not* bound down by adhesions on its peritonæal surface, but not if it is. By observing also, as Dr. Sibson suggests, whether the tumour descends during inspiration, and by grasping and endeavouring to slide the abdominal parietes over the tumour, much valuable information will be derived.

There are two modes of operating. The first is by means of a long incision from sternum to pubes ; which was practised some years ago by Mc Dowall, of Kentucky, and by Mr. Lizars, and of late by Dr. Clay of Manchester. The manner of operating, and the previous and subsequent treatment which Dr. Clay adopted were as follows:—The night before the operation he gave ten grains of inspissated oxgall, and repeated it in the morning, believing it to have the power of evacuating the alimentary canal and of dispelling flatulence with the least possible amount of irritation. The patient being placed comfortably on a table, he severed the integuments from sternum to pubes with one stroke—an incision 24 inches long ; then having carefully cut through the peritonæum at the upper part, sufficiently to introduce two fingers of his left hand, he passed in a probe-pointed bistoury, and, under the protection of his fingers, divided the peritonæum to the extent of the first incision. The pedicle of the tumour, one of the broad ligaments, was then firmly tied and cut through ; but as it was excessively thick, some of the vessels in it continued to bleed and required separate ligatures. The hands were now passed round the tumour in search of adhesions ; some that were soft and recent gave way readily to the slightest touch : but an extensive omental adhesion required to be divided by the scalpel, and a vessel that bled freely was secured. The tumour was then lifted up and removed. When all bleeding had ceased, the integuments were brought together with nine stitches, and straps of adhesive plaster ; and a broad bandage was passed round the body. The subsequent treatment consisted in giving small doses of henbane and morphia when necessary ; opening the bowels by clysters ; relieving flatulence by introducing a gum elastic tube ; and nourishing the patient with as simple a diet as possible. The incision should be made to diverge a little so as not to cut through the umbilicus; and if on examining the tumour it is found either to be of a different nature from what was anticipated, or to have contracted excessively numerous and wide adhesions, it is better to close the wound quietly, without attempting to extirpate it. In order to bring the sides of the abdomen evenly together, a number of lines may be marked across the linea alba with nitrate of silver before the operation.

The second mode of operating is by means of an incision through the linea alba, below the umbilicus, of from two to four inches in length. As soon as the ovarian cyst is exposed, it is to be punctured, and the edges of the puncture being seized with a hook or forceps, the whole of the cyst is to be dragged out of the wound, as it gradually collapses on the fluid escaping; then the pedicle of the cyst having been transfixed with a needle armed with a strong ligature, is to be tied tightly and cut off. Whilst the cyst is protruding, an assistant should keep his hands on the margins of the wound, to prevent any escape of the bowels. An estimate may be formed whether the tumour consists of one cyst or many, by the quantity of fluid which escapes when the puncture is made; and if a second cyst is discovered, it may be punctured and dragged out as well. This operation was suggested many years ago, although never performed, by Dr. W. Hunter. It was revived in 1838 by Mr. Jeaffreson, and has since been adopted by Mr. B. Phillips, Dr. F. Bird, Mr. Lane, and other operators. It may be remarked that the temperature of the apartment in which any such operation is performed, ought to be raised to 70°.*

III. VIOLENT BLOWS ON THE ABDOMEN from obtuse substances, the passage of cartwheels, spent shot, and so forth, may produce various results. 1. They may cause severe *concussion* and collapse, which may either speedily prove fatal, or may pass off without further ill consequences, or may be succeeded by inflammation.

2. They may produce *laceration* of the bowels, or of the solid viscera; with effusion of blood or of their secretions into the peritonæal cavity. This may be suspected if the patient complains of excruciating pain radiating over the whole belly; if the features are pinched, the belly soon swells, and the pulse is very small and tremulous.

Treatment.—The patient must be suffered to lie quietly during the stage of collapse, without any officious administration of stimulants:

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* Vide Lizars on the Extirpation of Diseased Ovaria, Edinburgh, 1825; account of Dr. Clay's operations in Braithwaite's Retrospect, vol. vii.; and of two successful operations by Mr. Walne, Lond. Med. Gaz., 23rd Dec. 1842, and 7th July, 1843; Jeaffreson, Lancet, 7th January, 1839; King, Lancet, 21st January, 1837; West, Lancet, 25th November, 1837; also Med. Gaz., November 24th, 1838; and case by Mr. B. Phillips, Med. Gaz., October 10th, 1840; also B. Phillips, Med. Chir. Trans. vol. xxvii. For further information, refer to the works and papers of I. B. Brown, Tilt, Clay of Manchester, B. Phillips, Lane, Frederick Bird, and Walne.

and as soon as pain or vomiting comes on, he should be bled. Subsequently bleeding, leeches, and fomentations to the belly, to abate inflammation; and large doses of opium to support the system under the irritation, are the only available remedies. The bowels should not be disturbed either with purgatives or enemata for the first three days, nor should any nutriment be taken, save very small quantities of the mildest fluids at intervals.

IV. Abscesses between the abdominal parietes occasionally result from contusions or punctured wounds, and sometimes occur idiopathically. According to the principles laid down in the chapter on abscess, they should be opened early, both because of the tendinous structures by which they are covered, and of the possibility that they might burst into the peritonæum.

V. Penetrating Wounds of the abdomen may be divided into four species: namely, 1st, simple wounds of the parietes; 2ndly, wounds of the viscera; 3rdly, wounds of the parietes with protrusion of the viscera; and, 4thly, wounds in which some of the viscera are protruded and wounded likewise.

1. In the case of a *simple wound of the parietes*, the surgeon must first (if it be large enough) gently introduce his finger, to ascertain that no part of the intestines is beginning to protrude; then the wound must be closed by sticking-plaster; or by suture, if it is extensive. If the epigastric artery is divided, it must be cut down upon and tied. The surgeon must recollect that when any part of the abdominal parietes has been wounded or severely bruised, it is almost certain afterwards to become the seat of hernial protrusion.

2. *Wounds of the viscera.*—In the case of small wounds of the abdomen without protrusion, it will be often impossible to say whether the bowels are wounded or not, but the treatment must be altogether the same, whether they are or not.

(*a*) Wounds of the *stomach* may be known by the situation and depth of the wound, by vomiting of blood, by the very great depression and collapse, and by the nature of the matters (if any) that escape from the wound.

(*b*) Wounds of the *bowels* may *perhaps* be known by the passage of blood with the stools, or by fæcal matter escaping from the wound, or by the symptoms of extravasation of their contents into the abdominal cavity—that is to say, excruciating pain, radiating over the whole belly from the seat of the injury, and attended with signs of great collapse. Fortunately, however, as Mr. Travers has shown, wounds of the stomach and intestines, unless very large, are not so liable to be attended with extravasation as was formerly thought. For, in the first place, the mucous membrane protrudes through the muscular, so as to fill up a small aperture; and, secondly, any tendency to extravasation is counteracted by the constant equable pressure of all the abdominal viscera against each other. Moreover, lymph is soon effused, and glues the neighbouring parts together, and thus the aperture is circumscribed, and any future extravasation is prevented.

(*c*) Wounds of the *liver*, if extensive, are, from its great vascularity, nearly as fatal as those of the heart. Small wounds may be recovered from. There will at first be symptoms of great collapse, which, if the patient survive, will be succeeded by severe sickness, pain in the liver, yellowness of the skin and urine, great itching, and a glairy, bilious discharge from the wound.

(*d*) Wounds or rupture of the *gall bladder* are almost invariably fatal, although there are one or two instances of recovery on record.

(*e*) Wounds of the *spleen*, if deep, are also fatal, from the great hæmorrhage that follows, although the whole organ has been removed from animals (and, it is said, from man) without much consequent evil.

(*f*) Wounds of the *kidneys* are attended with bloody urine. They are exceedingly dangerous, first from hæmorrhage, next from violent inflammation with excessive vomiting; and, lastly, from profuse suppuration, kept up by the passage of urine through the wound. Venæsection, very mild laxatives, the warm bath, avoidance of too much drink, very light dressings, so as to admit of the flow of urine through the wound, and some unctuous application to prevent excoriation of the surrounding skin, are the necessary measures.

(*g*) Wounds of the *bladder*, if communicating with the peritonæum, are extremely dangerous, owing to extravasation of urine. In fact, unless there is an external wound through which it can escape, they are almost uniformly mortal. The catheter must be worn constantly. Mr. Syme (in his "Contributions") gives a case of rupture of the bladder below the line of reflection of the peritonæum, in which the patient recovered, free incisions having been made to give exit to the urine which was extravasated between the abdominal muscles and skin.

3. *If the intestines protrude*, and are neither wounded nor gangrenous, they should first be freed from any foreign particles that stick to them, and then be returned as soon as possible. The patient should be placed on his back, with his shoulders raised, and his knees drawn up. If absolutely necessary, the wound must be a little dilated with a probe-pointed bistoury. Then the surgeon should return the bowel portion by portion, passing it back with his right fore-finger and thumb, and keeping his left fore-finger on that which is already replaced, to prevent it from protruding again. He should be careful to replace intestine before omentum, and the part that protruded last should be returned first.

4. If the stomach and intestines, when *protruded*, *are found to be wounded*, the wound should be sewn carefully up with a fine needle and silk, by the *continuous* or *glover's suture* (p. 111), in such a manner as to bring the edges into apposition, and prevent all extravasation between them. Then the part should be replaced, and the external wound be closed. The aperture in the bowel will be united, as in other cases, by the adhesion of contiguous surfaces; and the silk employed in the suture will be detached by ulceration, and fall into its cavity. If, however, any part of the bowel that is protruded be

very much lacerated, or be gangrenous, it should not be returned, but be left hanging out, that an *artificial anus* may be formed.

The symptoms of *inflammation of the peritonæum* or abdominal viscera, which is of course exceedingly likely to follow these wounds and injuries, may readily be recognised. The patient lies on his back, with his knees drawn up; he breathes solely with the thorax and not with the diaphragm or abdominal muscles; the countenance is anxious; the pulse small, wiry, and resisting, but becomes fuller after bleeding; there is severe throbbing pain, with great tenderness, more or less widely diffused; a dry tongue, constant nausea, or vomiting, and obstinate constipation, complete the catalogue. If the case proceeds to a fatal termination, the belly swells, partly from serous effusion, partly from tympanites; and the pulse becomes more frequent and weak, the patient retaining his senses to the last.

The *after treatment* of all these cases is the same. The patient must be kept at perfect rest, and should lie on the wounded part, if such a posture be easy. Venæsection, calomel and opium, and leeches must be sedulously employed to avert hæmorrhage and inflammation, and the indication for bleeding must be taken rather from the stomach than from the pulse. The pulse will, from the nature of the parts inflamed, be small, and perhaps weak; but if there be vomiting, bleeding may be performed without fear. After the bleeding, large doses of opium should be given, and should be repeated, so as to keep the system under its influence. Nothing but water, or thin arrow-root, should be given for three days, when the stomach or intestines are probably wounded.

The author hopes that it is unnecessary to warn his readers against the fatal and abominable custom of giving purgatives in cases of inflammation of the bowels arising from wounds of the abdomen. It is quite true that the bowels will be obstinately costive; but this costiveness arises from their being inflamed, and unable to propel their contents onwards; and the proper remedies for it, are such as will relieve the inflammation—that is, bleeding, leeches, fomentations, and calomel and opium. But if, in spite of common sense, the surgeon attempts to overcome the costiveness by colocynth pills and black draughts, he will soon induce an obstimate vomiting, that will render all his other remedies nugatory. If in any case of inflammation of the bowels it is probable that they are loaded with fæces, the proper remedy is the repeated injection of warm water as an enema.*

VI. ARTIFICIAL ANUS signifies a preternatural communication between the intestine and skin. It may be a consequence of penetrating wounds, of abscess or ulceration of the intestines, or of mortification of intestine in strangulated hernia, and it is sometimes purposely made by the surgeon in cases of imperforate anus, in order to afford an exit for the fæces. The external opening is irregular, everted, and red, and the surrounding skin excoriated. The aperture in the intestine adheres by its margin to the peritonæum, so that extravasation into the abdomen is prevented. That portion of intestine which is immediately above the aperture, and that portion which is immediately below it, meet at the artificial anus at a more or less acute angle, and present two orifices ; one by which matters descend from the stomach, and another which leads down to the rectum. These two orifices are separated by a sort of crescent-shaped septum, formed by a projection of the mesenteric side of the bowel opposite to the aperture. Now it may readily be understood that the greater the aperture in the bowel, the more acute will be the angle at which the upper and lower portions meet, and the greater will the septum also be ; and that, if the septum is large, it will act as a valve, and close up the orifice of the lower portion of bowel, causing any matters that come down through the upper portion to escape externally, instead of passing into the lower.*

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* Vide Travers on Wounds of the Intestines, Lond. 1812; Hennen's Military Surgery; the observations on the treatment of Enteritis in Ferguson on Puerperal Fever; Griffin's Medical Problems; and Dr. Holland's Notes and Reflections.

The *consequences* of this affection may be, 1st, that the patient may die of starvation, from the escape of the chyle, if the aperture is near the duodenum. 2ndly, that a portion of the intestine may protrude and form a hernia; besides the constant disgusting annoyance occasioned by the escape of fæcal matter and flatus.

Treatment.—If the affection is of recent origin, and especially if it is consequent upon strangulated hernia, the patient should remain in bed, and great care should be taken to keep the parts clean ; and then, perhaps, the external aperture may contract and cicatrize. If the latter is very small, and if the passage between it and the bowel is of some length (a state of parts termed *fæcal fistula*), something may perhaps be done by compression, or by engrafting a piece of skin over the aperture ; or by making an oval incision in the skin on each side of the aperture, and bringing the outer edges of the incision together by means of needles and the twisted suture ; or by applying the actual cautery to the margin of the wound.

But if the loss of substance in the bowel is considerable, and the projecting septum large, the chance of recovery is not great. A pad of simple linen or lint may be worn to compress the aperture, and prevent discharge from it, or sometimes a hollow truss with a leathern or horn receptacle, may be used with advantage. Enemata are useful in all cases. Moreover, a tent may be thrust into both internal orifices, in order to enlarge the lower one, and repress the septum, as proposed by Dessault. As a last resource, a small portion of the septum may be nipped and strangulated by the forceps invented by Dupuytren for that purpose.

VII. GASTROTOMY.—There is a class of cases of obstruction of the intestines, in which it is found after death, that the mischief has been done by some one little band, and that if this could have been found and severed, the patient might have had at least a chance of recovery.

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* Vide the chapter on Artificial Anus in Lawrence on Hernia, and Dupuytren in Dict. de Méd. tom. iii.

Intestinal obstruction may, however, arise from many other *causes;* such as, 1st, *ileus*, or obstinate spasm; 2ndly, impaction of accumulated fæces, or, perhaps, of a large gall stone; 3rdly, solid growths within the intestine; 4thly, tumours pressing upon it from without; 5thly, stricture of the intestine; 6thly, invagination, or the slipping of one portion into, and constriction by another; and, lastly, constriction by bands of lymph; or by rents in the mesentery through which the bowel has slipped; besides internal hernia; obturator hernia, for example. Moreover, from whatever cause arising, the *symptoms* are usually much the same — viz., obstinate constipation; a vomiting, first of a yellowish or greenish liquid, then of a feculent or stercoraceous matter; and occasional fits of colicky pain—arising from the efforts of the intestine to overcome the obstacle, during which the coils of the distended guts can be seen through the abdominal parietes. To these essential symptoms, tenderness, and other signs of inflammation are added in greater or less degree.

Now the practical question arises; suppose there to be a case of evident mechanical obstruction of the bowels; that injections have been used as largely as they safely can; and that purgatives have been given till they do but add to the distressing vomiting; that leeches and opium and hip baths have been resorted to for the relief of tenderness; and that some space has been given, if the symptoms are not very urgent, to see what nature unaided can do, and that the case remains unimproved—shall the patient be left to die? or shall surgical means be resorted to, to give him a chance? The author would say, let the patient settle his affairs, worldly and spiritual, and let an operation be resorted to.

The most favourable circumstances which such a case can present are, if the patient is not too much exhausted by a long continuance of pain and vomiting; if he can point to any one spot as the seat of uneasiness and, probably, of stricture, and if an examination of the distended coils of intestine seems to confirm this suspicion; and if he has been known to suffer on former occasions from an attack of inflammation in the abdomen, thus making it probable that the obstruction is caused by bands of lymph, rather than by either of the other causes; and if the present attack have come on suddenly.

If the operation is determined on, the air of the apartment should be raised to about 70°; towels dipped in warm water should be ready to protect the bowels if they protrude; chloroform should be administered and the bladder emptied. Then an incision should be made through the linea alba below the umbilicus; the peritonæum be carefully opened, and the finger at once passed to the probable seat of obstruction. If a band is found, the finger must be passed under it, and a probe-pointed bistoury used to sever it; the wound should be closed with abundance of sutures, and a compress and bandage be placed over it. In a case in which the author operated, the patient pointed beforehand with perfect accuracy to the spot where the obstruction was found.

Should the operator either fail in finding an obstruction, or in relieving it, the desperate resource remains of opening the bowel, as low down as possible, and stitching the opened part to the edge of the wound in the parietes so as to establish an artificial anus.[*]

VIII. Amussat's Operation.—When an obstruction is situated in the rectum, or sigmoid flexure; or when the rectum is imperforate in a new-born child, and cannot be opened from below, the colon may be opened in the left lumbar region, so as to come upon it where it is uncovered by peritonæum. A transverse incision is generally made, above and parallel to the crest of the ilium, commencing two inches from the spine, and carrying it outwards for five or six, through skin and fat, and latissimus dorsi and quadratus lumborum muscles, and the fascia. When the bowel is reached, a ligature should be passed through it, to steady it, and then it should be opened with a bistoury. Mr. Hilton proposes a "vertical incision three inches or less in length, terminating below at half an inch above the crest of the ilium, parallel with, and an inch and a quarter distant from the outer edge of the erector spinæ, which enables him to bring into view the outer border of the quadratus lumborum muscle, and then to expose and open the colon which lies in front of that muscle." This latter operation was originally proposed by Callisen; that by the transverse incision by Amussat.[†]

IX. In a case of acute inflammatory disease of the Appendix Cœci, arising apparently from the impaction of a small mass of feculent matter, Mr. Hancock made an incision close above Poupart's ligament into the abdominal cavity, and gave issue to some offensive serum, to the great relief of the patient, who was moribund, but recovered. He proposes a similar operation for the purpose of letting acrid effusions drain away, in cases of unhealthy peritonitis, and the hint is a valuable one.[‡]

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[*] See a most able and comprehensive paper by Mr. B. Phillips, Med. Chir. Trans. vol. xxxi.; an account of a case by the author in the same vol.; and of others by Dr. Golding Bird and Mr. Hilton in vol. xxx.; by Mr. Fergusson, Lancet. 1850, vol. i. p. 128. Mr. Phillips's paper contains copious bibliographical notices, and a *catena* of opinions.

[†] See report of cases of this operation performed successfully by Mr. Field and Mr. Clarkson, read before the Med. Chir. Soc., Lancet, 1850, vol. i. p. 93; cases by Teale of Leeds, Prov. Med. Journ.; Evans of Derby, Med. Chir. Trans. vol. xxviii.; South's Chelius, vol. ii. p. 328.

[‡] A short account of disease of the Appendix Cœci, cured by operation; by Henry Hancock. Lond. 1848.

CHAPTER XVIII.

OF HERNIA.

SECTION I.—OF THE NATURE AND CAUSES OF HERNIA GENERALLY.

Definition.—Hernia signifies a protrusion of any viscus from its natural cavity. But the term, employed singly, is restricted to signify protrusion of the abdominal viscera.

Causes.—The formation of hernia may be readily understood by considering that the abdominal viscera are subject to frequent and violent pressure from the diaphragm and the other muscles by which they are surrounded, a pressure which tends to force them outwardly against the parietes of the abdomen. If any point of the parietes be not strong enough to resist this pressure, some portion of the viscera may be forced through it, and form a hernial tumour externally.

The *predisposing* cause of hernia, therefore, is a weakness of the parietes of the abdomen, which may be produced by various circumstances. Thus 1. some parts of the parietes are naturally weaker than others; especially the inguinal and crural rings, and the umbilicus; and it is at these parts that hernia most frequently occurs. 2. The abdominal parietes may be weak from malformation, or congenital deficiency. 3. They may be weakened by injury or diseases, such as abscesses, wounds, and bruises; or by distention by the pregnant uterus, or by dropsy.

The *exciting* cause is compression of the viscera, by the action of the muscles that surround them, and especially of the diaphragm. Hence hernia is so frequent a result of violent bodily exertion—lifting heavy weights and the like—especially if the patient have been previously weakened by illness. Moreover, it is not uncommon in persons afflicted with stone or stricture, from the immoderate straining that they employ in passing their urine.

The viscera most liable to hernial protrusion are the small intestines, omentum, and arch of the colon. But every one of them has occasionally been found protruded, partially or entirely—especially in cases of congenital deficiency of the abdominal parietes.

The Sac of a hernia is a portion of the *parietal* or *reflected* layer of peritonæum which the protruding viscera push before them in their escape, and which forms a pouch containing them. It very soon contracts adhesion to the surrounding cellular tissue, and consequently does not return into the abdomen when the viscera are replaced; although it must be observed, that a hernia may be pushed back *en masse*, sac and all, when great force is used in reducing a strangulated hernia. As the hernia increases in size, the sac also increases; partly by growth, partly by distension, and slight laceration or unravelling; partly by fresh protrusion of peritonæum. Sometimes it diminishes in thickness whilst increasing in capacity; sometimes, on the contrary, it becomes thick, indurated, and divisible into layers. Its *neck* (the narrow part which communicates with the abdomen) always becomes thickened, rigid, and more or less puckered, in consequence of the pressure of the muscular or ligamentous fibres which surround it. Sometimes the sac has two constricted portions, or *necks*—either because (as in oblique inguinal hernia) it passes through two tendinous apertures—(the external and internal abdominal rings)—or because the original neck has been pushed down by a fresh protrusion. Some herniæ, however, are destitute of a sac, or at least of a complete one. This may happen,—1. If the protruded viscus is not naturally covered by peritonæum; as the cœcum. 2. If the hernia occur in consequence of a penetrating wound. 3. In some cases of congenital umbilical hernia. 4. Hernia may be considered virtually without a sac, if the sac has been burst by a blow, or if it has become entirely adherent to its contents. Instances, again, are known in which two peritoneal sacs have protruded through one and the same aperture in the abdominal parietes; and in which one sac has come down within a previously existing one.

Division.—Hernia is divided into several species; 1st, according to its *situation*—as the inguinal, femoral, and so forth; 2ndly, according to the *condition of the protruded viscera;* which may be (*a*) *reducible*, or returnable into the abdomen; (*b*) *irreducible*, that is, not returnable into the abdomen; or (*c*) *strangulated;* that is, subject to some constriction which not only prevents their return into the abdomen, but also interferes with the passage of their contents, and with their circulation.

SECTION II.—OF THE REDUCIBLE HERNIA.

Symptoms.—A soft compressible swelling appears at some part of the abdominal parietes. It increases in size when the patient stands up; if grasped, it is found to dilate when he coughs or makes any exertion; and it diminishes or disappears when he lies down, or when properly directed pressure is made upon it. If the sac contains intestine (*entero-cele*), the tumour is smooth, rounded, and elastic; *borborygmi* (or flatulent croakings) are occasionally heard in it, and when pressed upon, the bowel returns into the abdomen with a sudden jerk and gurgling noise. If, however, it contains omentum (*epiplo-cele*), the tumour is flattened, inelastic, flabby, and unequal to the touch, and when pressed, it returns without noise, and very slowly, the pressure requiring to be continued till it has nearly disappeared. But very often one hernial sac contains both intestine and omentum (*entero-epiplo-cele*); and very frequently it is perfectly impossible to ascertain which it contains, by any external examination.*

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* From κήλη, *tumour;* ἔντερον, *intestinum;* and ἐπίπλοον, *omentum.* The word κήλη is frequently used in the older surgical terminology; ex. gr. *hydrocele*, a tumour containing water: *hæmatocele*, a tumour containing blood; *bubonocele*, a hernial tumour in the groin.

Treatment.—The indications for the treatment of reducible hernia are 1. to replace the hernia, and 2. to keep it up by the use of a *truss*, an instrument consisting of a pad placed on the seat of protrusion, and of a steel spring which passes round the body, and causes the pad to press with the requisite degree of force. In writing for a truss it is usual to give the circumference of the body at the hips, midway between the spine of the ilium and the trochanter. The patient must expect to find the truss rather irksome for the first week. It should be constantly worn by day; and if the patient will submit to wear it at night also, so much the better. If he will not do this, he should, at all events, apply it in the morning, before he rises from the recumbent posture. The skin of the part which it presses upon should be regularly washed, and bathed with Eau de Cologne or spirit, else large boils are apt to form on it.

There are some cases in which the common truss fails to keep up a rupture comfortably, and for these the surgeon should be prepared to recommend other instruments, which are for the most part, the property of various individuals, and each of which has some peculiarity adapting it to particular cases. *Coles's truss*, has a spiral spring acting on the pad. The *MacMain lever truss* has a simple belt passing round the body, thus dispensing with the usual circular spring; and the pressure on the pad is effected by means of a strap passing under the thigh, and acting on a spring lever attached to the pad. *Salmon and Ody's* self-adjusting truss has a pad revolving on a ball and socket. The *Maidstone truss* allows the pad to slide on the spring so that the circumference of the instrument may be adapted to the varying size or movements of the body. *Egg's truss* is said to be made of old sword blades; it is very strong, though not irksome. and requires no fastening. *Adams's graduated pressure truss* has two springs of different curves, by sliding which on one another the amount of pressure may be varied. In *Tod's truss*, the spring goes round the waist, and curves downwards to compress a pad at the internal abdominal ring. *Newson's* wire truss, has a round wire, instead of a flat steel spring, which renders it less likely to be displaced. Trusses may have *French pads*, which are of an oblong-triangular shape, instead of oval, like the English; or pads filled with air; or may have springs going entirely round the body. But perhaps the most ingenious instrument, and that which is likely to be the most useful, is one recently devised by Dr. Arnott, in which, by means of a wire, external to the steel spring, and capable of being tightened or slackened by a nut and screw, the amount of pressure can be regulated with the greatest possible nicety.* For children an *India-rubber* band and pad often answer without a spring. A pad of hard polished wood is recommended by Mr. Dartnell. He also uses flannel instead of leather as a covering for the spring, as it can be washed.†

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* It is made by Spratt, of Brook Street, Hanover Square.

† Lancet, 1848, vol. ii.

Radical Cure.—If the patient is below the age of puberty, or not much above it, and if the hernia has not existed very long, it is probable that the truss, if constantly worn, may effect a permanent cure. The herniary aperture, no longer subject to distension, may become firmly closed, and the neck of the sac obliterated. This cure may perhaps occur in two or three years, but, as a measure of precaution, the truss should be worn for two or three years more. One or two measures for the radical cure of inguinal hernia will be mentioned in their proper place.

SECTION III.—OF THE IRREDUCIBLE HERNIA.

Definition.—Hernia is said to be *irreducible* when the protruded viscera cannot be returned into the abdomen, although there is no impediment to the passage of their contents, or to their circulation.

Causes.—Hernia may be rendered irreducible, 1, by an adhesion of the sac to its contents, or of the latter to each other, or by membranous bands formed across the sac. 2. By enlargement of the omentum or mesentery—whether from simple deposition of fat, or from sarcomatous or other organic change. 3. Omental hernia may be rendered irreducible by a contraction of that portion which lies in the neck of the sac, so that it is not stiff enough to stand against the pressure intended to push it back into the abdomen, but doubles up under it.

Consequences.—Irreducible hernia may produce sundry inconveniences. In the first place, the patient is often liable to dragging pains in the abdomen, or perhaps attacks of vomiting, which come on after food, or when he assumes the erect posture, because the protruded omentum or intestines, being fixed, resist all distension or upward movement of the stomach. These inconveniences will be greatly aggravated, if the patient increase in corpulency, or become pregnant. Moreover, the protruded bowels being deprived of the support naturally afforded them by the abdominal muscles, their fæculent contents are apt to lodge in them, and frequently cause colic or constipation. Lastly, the bowel is greatly exposed to external injury, and in constant hazard of strangulation.

Treatment. — This may be either palliative or radical. 1. The *palliative* treatment consists in applying a hollow bag truss, or else a truss with a hollow pad that shall firmly embrace the hernia, and prevent any additional protrusion. The patient should avoid all violent exertion or excess in diet, and should never let his bowels be confined.

2. *Radical Cure.*—It has occasionally happened, after confinement to bed for several weeks with fever or some other emaciating ailment, that a hernia, irreducible before, has been replaced with ease, owing to an absorption of the fat of the omentum or mesentery, and relaxation of the abdominal apertures. The same result has also in some cases been effected by art—by keeping the patient in the recumbent posture

and on very low diet for six weeks or two months, and by the frequent uses of glysters and laxatives, and at the same time by keeping up a constant equable pressure on the tumour by means of a bag truss made to lace over it. This plan is very uncertain as to its results, and will be effectually defeated if there are any adhesions; and, besides, there are not many patients who will submit to it. It will be more likely to succeed if the hernia is omental, than if it contains intestine. But several instances are known, in which, after the contents of old herniæ had been replaced, they produced so much irritation in the abdomen, that the patients were glad to compound for their life by keeping the hernia. Any surgical operation with the view of opening the sac, dividing adhesions, and returning the parts into the abdomen, is scarcely justifiable, as it would be exposing life to too great a hazard for the removal of a mere inconvenience.*

SECTION IV.—OF STRANGULATED HERNIA.

Definition.—Hernia is said to be strangulated, when it is constricted in such a way, that the contents of the protruded bowel cannot be propelled onwards, and the return of its venous blood is impeded.

The *causes* of strangulation may be, 1. A sudden protrusion of bowel or omentum through a narrow aperture, in consequence of violent exertion (a thing not unlikely to happen if a truss has been worn for some time, and then is carelessly left off). 2. Distension of the protruded intestines by flatus or fæces, or tumefaction and congestion of the omentum or mesentery.† 3. Swelling of the neck of the sac, or spasm of the muscular fibres around it.

The *seat of stricture* is generally at the thickened portion of peritonæum which forms the neck of the sac: but sometimes it is caused by tendinous bands external to it. In some rare cases the bowel has been constricted by membranous bands, or by fissures in the omentum in the sac itself.

The *symptoms* of strangulated hernia are, *first*, those of obstruction of the bowels; *secondly*, those of inflammation. The patient first complains of flatulence, colicky pains, a sense of tightness across the belly, desire to go to stool, and inability to evacuate. (It is true that stools may be passed if there be any fæcal matter in the bowel below the hernia, or if the hernia be entirely omental, but with very transient relief.) To these symptoms succeed vomiting of the contents of the stomach, then of mucus and bile, and lastly, of matters which have acquired a *stercoraceous* appearance by being delayed in the small intestines. Meanwhile the tumour is uneasy, tense, and incompressible.

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* A case in which Velpeau practised subcutaneous incisions for the relief of an irreducible hernia, is related in Bull. Gen. de Thérap. 15 and 30 Aug. 1840.

† Mr. T. Wilkinson King, Med. Gaz. 5 May, 1843, shows that the duration of hernia before strangulation in above half the number of cases, is from 15 to 25 years; and attributes the production of strangulation in old cases to tumefaction of the bowel from defective circulation.

If this state of things continue, the inflammatory stage comes on. The neck of the sac becomes tender, and tenderness diffuses itself over the tumour and over the abdomen, both of which become very painful and much more swelled. The countenance is anxious; the vomiting constant; the patient restless and despondent; and the pulse small, hard, and wiry. After a variable time, the constricted parts begin to mortify. The skin becomes cold, the pulse very rapid and tremulous, and the tumour dusky red and emphysematous, but the pain ceases, and the patient, having perhaps expressed himself altogether relieved, soon afterwards dies.

Varieties.—There is often considerable diversity in the rapidity and violence of these symptoms. If the patient is a strong adult, and the strangulation has commenced suddenly with a fresh protrusion during some forcible exertion, the inflammatory stage may come on instantly, and be followed by death in a very few hours. On the other hand, if the patient is old, if the hernia has been long irreducible, and has a large neck, and if the strangulation is produced by distension of the protruded bowel with flatus or fæces—the symptoms of mere obstruction may last many days before those of inflammation come on. To this latter class of cases the term *incarcerated* is applicable.* Again, if the hernia be omental, the symptoms will probably be less acute than if it be intestinal; but not much less.

Diagnosis.—If a patient with irreducible hernia be attacked by colic, or enteritis, or peritonitis, the case will present many of the features of strangulation. Yet it may perhaps be distinguished by noticing that the pain and tenderness did not begin at the neck of the sac, and are not more intense there than elsewhere. The diagnosis will be very obscure if the inflammation commences on the omentum or intestine in the sac. But the general rule is, *when in doubt, operate.*

In every case of sudden and violent vomiting and colic, the surgeon should make it a rule to examine the bend of the thigh, the scrotum, and the other ordinary seats of hernia, and to make strict inquiry for any tumours about the abdomen; because the patient may have been labouring under hernia for years, and yet from ignorance or *mauvaise honte* may not mention it.

Morbid Appearances.—After death from strangulated hernia, the bowels are found reddened, the upper portion of them much distended, and there are effusions of turbid serum and lymph. Around the sac the tissues are œdematous or emphysematous. The strangulated intestine is dark, claret-coloured, and turgid with blood, roughened in patches by a coating of lymph, and displaying patches of gangrene, in the form of greenish or ash-coloured spots, which break down under the finger. The omentum is dark red; if gangrenous, it feels crispy and emphysematous, and the blood in its veins is coagulated. The sac also contains bloody turbid serum.

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* There is great confusion in the use of these terms, as some surgeons employ the term *incarcerated* to signify what is generally known as *irreducible* hernia.

Treatment.—The indications are, 1st, to return the intestine, or any portion of it that may not be irreducible; 2ndly, to divide any constricting part, if necessary; 3rdly, to obviate inflammation.

The Taxis.—In the first place, an attempt should be made to return the protrusion by a manual operation, technically called *taxis.*[*] The bladder having been emptied, the patient should lie down, and be put under the complete influence of chloroform; if this be not used, he should be made to lie in a warm bath, with his shoulders raised; and both his thighs should be bent towards the belly and be placed close to each other, so that every muscle and ligament connected with the abdomen may be relaxed. If not narcotized he should be engaged in conversation to prevent him from straining with his respiratory muscles. Then the surgeon, if the tumour be large, grasps it with the palms of both hands, gently compresses it in order if possible to squeeze a little of the flatus into the abdomen, pushes it *in the axis of the neck of the sac*, and at the same time with his fingers gently kneads and *sways* the parts at the neck of the tumour, or perhaps tries to pull them very gently downwards, in order if possible to dislodge them. This operation may be continued for a quarter or half an hour or longer if the tumour is indolent, but not so long if it is tender, and at last, perhaps, the surgeon will be delighted to hear a gurgling sound accompanying the return of a portion of intestine. The operator should recollect that too much force may bruise or rupture the viscera, or drive sac and all into the abdomen, or push them between the layers of abdominal muscles, and that he must not be satisfied with a partial reduction of the volume and tension of the tumour, if the vomiting remains unrelieved, because, as Mr. Mayo has shown, such a diminution might be caused by merely forcing the serum contained in the sac into the abdominal cavity.

If the taxis do not succeed, certain auxiliary measures are commonly resorted to.

(*a*) The first to be mentioned is *chloroform*, inhaled till it produces complete relaxation and unconsciousness.

(*b*) *Bleeding* to the approach of syncope may be tried if the patient is robust, the hernia small and of recent date, and if there is much tenderness of the sac or of the abdomen, in which latter case it should be employed before trying the taxis.

(*c*) The *hot bath* (96°—100° F.) continued long enough to produce great relaxation is useful in similar cases; but it must be recollected that a delicate person will not be very likely to bear the shock of an operation, if bled or boiled to death's door first of all.

(*d*) A large dose of *opium* or *morphia*, is a remedy most useful in cases of acute strangulation, if for any reason chloroform be not given; and especially if the pain and vomiting are violent.

(*e*) The *tobacco enema* (ʒj ad Oj aq. ferv. allowed to stand ten minutes, and half to be used at a time) has certainly been successful in many cases, especially of inguinal hernia, but it is a most dangerous remedy. It has proved immediately fatal to some patients, and has rendered others incapable of surviving the shock of the operation.

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[*] From τάσσω, I set in order.

(*f*) *Cold* applied to the tumour by means of pounded ice or a freezing mixture (F. 114) in a bladder, is useful by reducing inflammation, condensing flatus, and constringing the skin. It is most applicable to large scrotal herniæ. It, too, is not without its hazards, for it may cause gangrene of the skin if applied too long, or if hot applications are incautiously used after it.

(*g*) *Purgatives and enemata* are irritating and mischievous in sudden acute strangulation, but vastly beneficial if the patient is aged, the hernia large and long irreducible, and if the attack has been preceded and caused by constipation. Large doses of calomel and colocynth are the best purgatives, and the enemata should consist of as much salt and water as can be injected without causing very much pain or distension. Moreover, Dr. O'Beirne has fully shown that greater benefit is to be derived in cases of incarcerated hernia and obstinate constipation from passing up a long tube (the tube of a stomach-pump answers very well) into the colon, than from the use of the ordinary short enema pipe. The long tube relieves the bowels of their flatus; and of course by diminishing the bulk of the contents of the abdomen, renders the return of the hernia more easy.*

In old standing cases, occurring to aged people with large herniæ, the surgeon may be justified in waiting some time to try the effect of his remedies; but in acute cases occurring to young people, it may be laid down as a general rule that, if the taxis, aided perhaps by chloroform or opium, do not succeed, it is the safest plan to perform an operation for dividing the stricture without further delay.

The *operation* generally performed consists in opening the sac, dividing the stricture, and returning the intestine. The manner of doing which for each variety of hernia, will be found in the following sections. When the sac is opened, the intestine should be well examined, and especially that part of it which has been actually compressed by the stricture, and which should be gently drawn down for that purpose. If it be merely dark claret-coloured from congestion, or slightly roughened with lymph, or if it exhibit a few black patches of ecchymosis, it should be returned—the operator being careful to replace it bit by bit—intestine before omentum—and those parts first which protruded last. The wound may then be closed with one or two sutures, and a firm compress be placed upon it.

If the hernia was irreducible long before it was strangulated, and if its contents are united to the sac by firm broad adhesions, they should not be disturbed. But if the adhesions are recent, or very thin and slight, they may be divided and the bowel be returned.

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* Vide Lancet, July 6 and 27, 1839; also James's Retrospective Address, in Prov. Med. Trans. 1840; and O'Beirne on Defæcation.

If the intestine is mortified, which will be known by the softened green or ashy spots, the mortified part should be slit open, the stricture be divided, and the patient left to recover with an artificial anus. Again, if a large portion of the intestine, which has been long irreducible in an elderly person, appear extremely dark and advanced towards sphacelus, so as to render it doubtful whether it would be capable of performing its functions when returned, the safest plan is to make an opening into it, and so afford an outlet for its contents; although the inconvenience of an artificial anus must of course be considered.

If the omentum is gangrenous, or if it is thickened and indurated, it would, if returned, excite dangerous irritation of the peritonæum. In this case some surgeons advise it to be left to granulate in the sac, or to cut it off close to the neck of the sac, and leave it there as a plug to prevent further protrusion. Macfarlane and others, on the contrary, recommend it to be cut cleanly off, and all the vessels to be tied with fine silk ligatures, and the end to be then passed quite into the abdomen, breaking up any adhesions about the neck of the sac, if necessary; thus avoiding the dragging pains and colic which are liable to occur if a portion of the omentum or intestine is fixed.

But it may happen that there may be a portion of intestine concealed within the omentum, and completely enveloped in a kind of sac formed by it. This is especially liable to be the case in the umbilical hernia. Therefore, to use the words of Mr. Prescott Hewett, " when the hernial sac appears to contain thickened omentum only, the omentum ought to be drawn out and carefully examined, to see that it does not form a sac containing a portion of intestine."* If it is thickened and firmly united to the neck of the hernial sac throughout its whole circumference, an incision should be carefully made through it; bearing in mind that it is often extremely thick, and that the intestine may be firmly adherent to its inner surface. In fact, as Mr. Hewett says, the surgeon ought *carefully* to " examine every portion of omentum which is in a hernial sac, so as to ascertain that no knuckle of intestine is contained within its folds, before it is returned into the abdomen, left in the sac, or removed altogether."

Division of the Stricture external to the Sac.—Petit, Aston Key, Luke, and other eminent surgeons have recommended that the stricture should be released without opening the sac itself. The argument in favour of this proceeding is, that the dangers arising from rough handling and exposure of the intestine are greatly diminished, and the case brought nearer, as regards safety, on a level with one in which no operation has been performed. The circumstances under which this mode of operating seems most advisable, are when the hernia is of very great size, and has been long irreducible, so that the idea of returning its contents could not be entertained; and when the hernia is small, and of quite recent date. In a similar case, M. Guérin has divided the stricture by means of a subcutaneous incision.*

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* Med. Chir. Trans. vol. xxvii.

A modification of this operation has been proposed by Mr. Gay, which consists in making a small incision, near the neck of the sac, and carrying the tip of the forefinger to feel for the seat of stricture, and dividing it by a *bistouri caché*. We shall allude to this operation again when speaking of femoral hernia, to which it is chiefly applicable; and may remark that the advantages claimed for it are, that it meddles only with healthy parts, is slight, comparatively safe and easily performed, and that there is no long convalescence.

Hernia reduced en masse.—When the taxis is used forcibly for the reduction of a strangulated hernia, the tumour, sac and all, may be forced through the herniary aperture, and lie between the abdominal muscles and the peritonæum; or, rather, between the muscles and the fascia transversalis. In such a case, all the symptoms of strangulation continue, although the tumour disappears. The first thing to be done is to make the patient stand up and cough, in order if possible to bring the hernia down again, when it should be operated on without delay; but if this does not succeed, a cautious incision should be made through the abdominal parietes, over the suspected seat of the disease; and if found, the sac should be opened, the stricture divided, and the case be then treated according to the ordinary rules.†

After Treatment.—After the hernia has been returned, a compress —a towel, for instance—should be put on the site of the tumour, and be retained with a bandage, so as to prevent any protrusion from coughing, sneezing, or any other accidental exertion, and the patient should have a full opiate. The surgeon should not be in haste to get the bowels to act, and should abstain from giving salts and other purgatives; for as the intestine that was constricted remains for some time inflamed, weakened, and incapable of propelling its contents, they would but irritate it uselessly. Mr. Travers has very satisfactorily shown, that the great danger after the return of the hernia arises from palsy, and not from inflammation of the bowels.‡ Castor oil and laudanum may be resorted to after twelve or twenty-four hours. Tenderness, pain, and other inflammatory symptoms, may be allayed by leeching, and by calomel and opium, which is the sheet-anchor in all cases of peritonæal inflammation, after bleeding and fomentations. A truss should be applied before the patient gets up again.

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* Vide Fergusson's Practical Surgery, p. 526. Guerin, Gaz. Méd. de Paris, 7th Aug. 1841; Mr. Key's Memoir, on dividing the Stricture external to the sac; Luke, Med. Chir. Trans. vol. xxxi.

† See a report of a paper read by Mr. Luke, at the Roy. Med. Chir. Soc. in Med. Gaz. 5th May, 1843.

‡ Travers, case of Hernia, &c., Med. Chir. Trans. vol. xxiii.; see also Hancock's Essays on Petit's operation, &c., Lancet, 1849, vol. ii.

SECTION V.—OF INGUINAL HERNIA.

Definition.—Inguinal hernia is that which protrudes through one or both abdominal rings.

Varieties.—There are four varieties. The oblique, direct, congenital, and encysted.

1. The *oblique* inguinal hernia is the most common. It takes precisely the same route as the testicle takes in its passage from the abdomen into the scrotum. It commences as a fulness or swelling at the situation of the internal abdominal ring, that is to say, a little above the centre of Poupart's ligament, next passes into the inguinal canal (and in this stage is called *bubonocele*), and if the protrusion increase, it projects through the external ring, and descends into the scrotum of the male, or labium of the female. The *coverings* of this hernia are, 1, Skin. 2, A strong layer of condensed cellular tissue, derived from the *superficial fascia* of the abdomen, in which the *external epigastric artery* ramifies. With this is mostly incorporated, 3, the *fascia spermatica*, a tendinous layer, derived from the intercolumnar bands, a set of semicircular fibres which connect the two margins of the external ring. Under this lies, 4, the *cremaster muscle*, sometimes called *tunica communis*. 5. Next comes the *fascia propria*, a cellular layer continuous with the *fascia transversalis* of the abdomen; and lastly, 6, the sac. The *internal epigastric artery* is always internal to the neck of the sac. The *spermatic cord* is generally behind the sac; but, in old cases, the parts which compose the spermatic cord are separated by the tumour, so that the vas deferens and spermatic artery lie sometimes in front, sometimes on either side of it.

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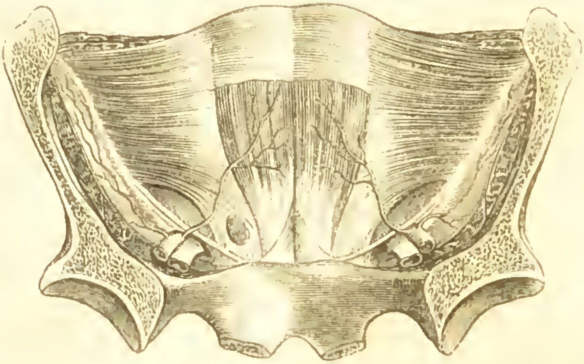

2. The *direct* inguinal hernia bursts through the *conjoined tendon* of

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* This diagram, copied from Tiedemann, gives an internal view of the parts concerned in the formation of hernia; and on the left side shows the usual place at which direct inguinal hernia protrudes.

the internal oblique and transversalis muscles, just behind the external ring. Its coverings are the same as those of the oblique variety, except the cremaster, for it has no connexion with the cord. The epigastric artery runs external to the neck of the sac. This hernia may, however, push the conjoined tendon before it, instead of bursting through it. The spermatic cord generally lies on its outer side.

3. The *congenital* hernia is a variety of the oblique, and is so called because that state of parts which permits of it only exists at or soon after birth. A portion of omentum or intestine accompanies the testicle in its descent, and passes down with it into the very pouch of peritonæum which forms the *tunica vaginalis reflexa*, before its com-

Fig. 1.[*]

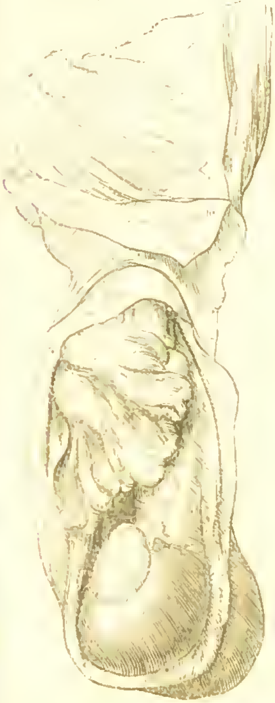
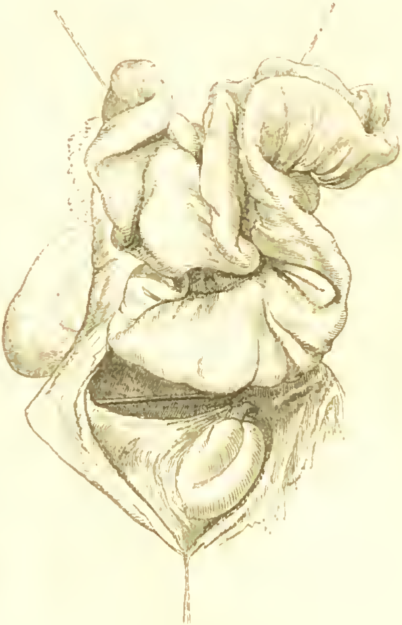


Fig. 2.



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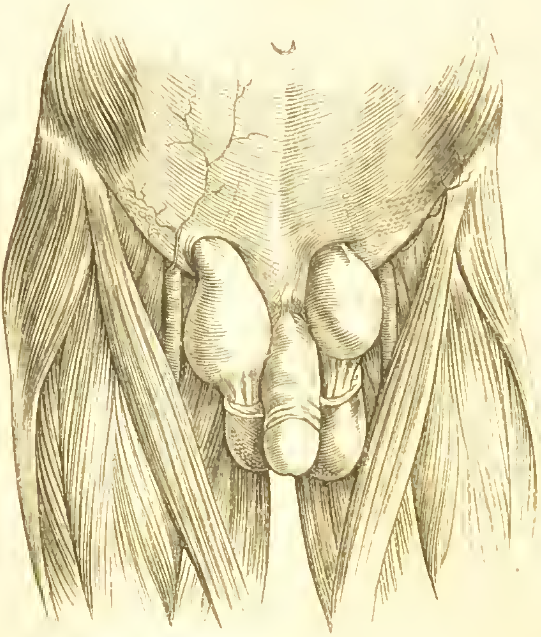
[*] From the King's College Museum. Fig. 1 exhibits a congenital omental hernia of the right side. Fig. 2, an encysted hernia; a kind which was first described by Hey of Leeds, in a letter to Gooch. (Vide Gooch's Chir. Works, vol ii. p. 217.) He says, "The intestine in this case had forced its way into the scrotum before the tunica vaginalis had formed its adhesion to the cord, but after its abdominal orifice was closed; under which circumstance it brought the peritonæum down with it, forming the hernial sac: contrary to what happens in the hernia congenita, where the intestine descends before the orifice in the tunica vaginalis has closed, and consequently has no hernial sac but that tunic."

munication with the general peritonæal cavity has become obliterated. The sac of this hernia is consequently formed by the tunica vaginalis; its coverings in other respects are the same as those of the oblique variety, and the protruded bowel lies in immediate contact with the testicle, and if not replaced, generally adheres to it.

4. The *encysted* (or *hernia infantilis*) is a sub-variety of the congenital. The protruding bowel pushes before it a sac of peritonæum either into or close behind the tunica vaginalis, and this tunic and the sac adhere very closely together. This hernia, therefore, has, as it were, two sacs: viz. one proper sac, and another anterior, composed of the tunica vaginalis, which in these cases is very liable to be the seat of hydrocele. The second figure in the preceding page, shows another variety of the encysted hernia, in which the sac is apparently formed of tunica vaginalis, but its communication with the testicle is closed.



Diagnosis.—1. The difference between the *oblique and direct inguinal herniæ*, and their relations to the epigastric artery, are shown in the accompanying figure, which is taken from Tiedemann. In the oblique, the neck of the tumour inclines upwards and outwards, and causes a fulness extending up to the middle of Poupart's ligament. In the direct, it inclines (if at all) rather inwards; and when the hernia is reduced, the finger, carrying integument before it, can be passed straight back into the abdominal cavity. But in old cases of oblique hernia, the neck of the sac is dragged down towards the mesial line, so that all distinction is lost.

2. *Hydrocele* may be distinguished from hernia by its beginning at the bottom of the scrotum; by its being semi-transparent and fluctuating, and preventing the testicle from being clearly felt (whilst the cord can be distinctly felt above it); and by not dilating on coughing. Whereas hernia begins at the top of the scrotum; it is not transparent; does not fluctuate; does not prevent the testicle from being clearly felt, although it obscures the cord; and dilates on coughing. But hernia may and does often co-exist with hydrocele, the former beginning from above, the latter from below. Moreover, a hernia consisting of intestine greatly distended with flatus, has been known to be as transparent as a hydrocele.

3. *Hydrocele of the Cord*, if low down, may be distinguished by its transparency and fluctuation; but if high up, it may extend into the abdominal ring, and receive an impulse on coughing, and the diagnosis be very difficult. But as a hernia may be concealed behind this kind of tumour, the rule, *when in doubt, operate*, should be acted upon in case of symptoms of strangulation.

4. *Varicocele* (or *cirsocele*), which signifies a varicose enlargement of the spermatic veins, resembles hernia, inasmuch as it increases in the erect posture, and perhaps dilates on coughing; but it may be distinguished from hernia by its feeling like a bag of worms; and although, like hernia, it disappears when the patient lies down, and the scrotum is raised, still it quickly appears again, if pressure be made upon the external ring, though that pressure would effectually prevent a hernia from coming down again.

5. Lastly, a testicle that has not come down through the external abdominal ring into the scrotum, has been frequently confounded with a *bubonocele*, or small hernia in the inguinal canal; and has been compressed with a truss, to the great pain and detriment of the patient. A little care and attention will prevent this mistake.

Treatment.—1. Inguinal hernia, if *reducible* must of course be kept up with a truss. Care must be taken not to let the pad bear against the spinous process of the pubes, or the spermatic cord. Malgaigne found that out of two hundred cases in which a common truss was applied, there was disease of the cord or testicle in sixty-five.*

Various plans have been proposed for the *radical cure* of this hernia. Most of them consist of measures for producing the adhesive inflammation in the sac, so as to obliterate its cavity; but since mere obliteration of the sac is no remedy for deficiency in the muscular parietes of the abdomen, they are not likely to answer, and we have omitted them in this edition. The most feasible plan consists in pushing a fold of integument up as far as possible into the neck of the sac, securing it in this inverted or invaginated position by means of two sutures (both ends of a ligature being passed from within the invaginated skin), and then denuding the pouch of invaginated skin of its cuticle by means of liquor ammoniæ, so that the surfaces of skin and peritonæum thus opposed to each other may adhere, and the neck of the sac be effectually plugged.

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* Malgaigne, Bull. Gen. de Thérap. 1839.

This operation, which was proposed by M. Gerdy, has been practised by Mr. Bransby Cooper, and with some benefit. For the herniary aperture in Mr. Cooper's patient was so large before the operation, that the bowel could not be kept up by a truss; whereas, after the operation, a common truss enabled the patient to pursue a laborious occupation with safety and comfort.*

2. The *irreducible* must be supported with a bag truss. If it contain only *omentum*, a common truss may perhaps be applied in the usual manner, so as to make the omentum adhere to and plug the neck of the sac. But this cannot often be borne, and is liable to induce swelled testicle.

3. In performing the taxis for the relief of *strangulated* oblique inguinal hernia, the patient should be placed in the position described in a foregoing page (474), with his thighs as close together as possible (although the surgeon must put one arm between them), and the pressure must be made upwards and outwards.

The *operation* for this hernia is performed thus:—The parts being shaved, and the skin made tense, an incision three or four inches long must be made through the skin, along the axis of the tumour, beginning from above its neck. This will be quite long enough, even for the largest hernia; because the object is to bring the seat of stricture fully into view, without exposing too much of the sac. Then the successive coverings before enumerated, are usually divided in the following manner:—a little bit of each is pinched up with forceps, and cut into with the knife held horizontally; a director is passed into this little aperture, and the layer is then divided on it to the extent of the incision in the skin. Cautious operators will find (or make) many more layers than those usually enumerated, which are, in fact, easily subdivisible, especially in old herniæ. When at last the sac is reached, which will be known by its bluish transparency, it is to be opened sufficiently to admit the finger, a little bit of it being first pinched up and cut through, so as to admit the director. Then the left fore-finger should be passed up into the neck of the sack to seek for the stricture, which will generally be at the internal ring. It may be at the external ring (or at both); but wherever it may be, it must be dilated so as to allow the finger to pass into the abdomen. A curved blunt-pointed bistoury or hernia knife—not cutting quite up to the point—should be passed up flat on the finger through the stricture, and its edge be then turned up so as to divide it; and in every case the division should be made *directly upwards*, parallel to the linea alba; and then, whether the hernia be direct or oblique, the epigastric artery will not be wounded. If no stricture be discovered in the neck, it must be sought for in the body of the sac.

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* Bransby Cooper, Guy's Hosp. Rep., Oct. 1840. For notices of other plans, see a case in Provincial Med. Journ., 16th Oct. 1841; B. and F. Med. Rev., July, 1845; Lancet, Feb. 21, 1846.

The subsequent proceedings,—the return or otherwise of the intestine, and the after-treatment—are detailed in the preceding section.

If the surgeon determines on performing Petit's operation, *i.e.*, without opening the sac, the first point, says Mr. Luke, is to ascertain the exact seat of the stricture. Now, since the stricture prevents the communication of impulse from any one part of the tumour to any other part beyond the stricture, all that is required is, to press the tumour firmly between the fingers of one hand so as to cause impulse, whilst with the fingers of the other hand at the neck of the sac, the precise point where impulse ceases is ascertained. At that point will be found the seat of stricture. "The next step is, to incise the integuments so that the centre of the incision shall be directly over the stricture ; a proceeding easily accomplished by causing a transverse fold to be pinched up between the fingers and divided by transfixing it with a straight bistoury, in a direction parallel with the long axis of the tumour. The various fascias are subsequently divided, until the neck of the tumour is fairly exposed. If this be carefully and completely done, a depression will usually be observed at the seat of stricture, presenting a more contracted appearance at that part than at others. To the touch this contracted part feels thick, while into it thin layers of fascia dip, which may be mistaken for the stricture itself, but which may be divided wholly independent of it, and no relief arise from the division. When these layers are turned back, the real stricture is exposed to view." Then the next step is, to scarify the thickened peritonæum forming the stricture, so as to render it dilatable, without actually cutting through it, and then the taxis is to be used for the return of the hernia. When the stricture is caused by the margin of the external ring, it is easily divided by the hernia-director and bistoury; when at the internal ring, it must be done by the same means, although the operation is more difficult.*

SECTION VI.—OF FEMORAL OR CRURAL HERNIA.

Definition.—Femoral hernia is that which escapes behind Poupart's ligament.

It passes first through the *crural ring*—an aperture bounded internally by *Gimbernat's ligament*—externally by the femoral vein—before, by Poupart's ligament—and behind by the bone. It next descends behind the *falciform process* of the fascia lata ; thirdly, it comes forwards through the *saphenic opening* of that fascia ; and lastly, as its size increases, it does not descend down on the thigh, but turns up over the falciform process, and lies on the anterior surface of Poupart's ligament. The *coverings* of this hernia are—1. Skin. 2. The

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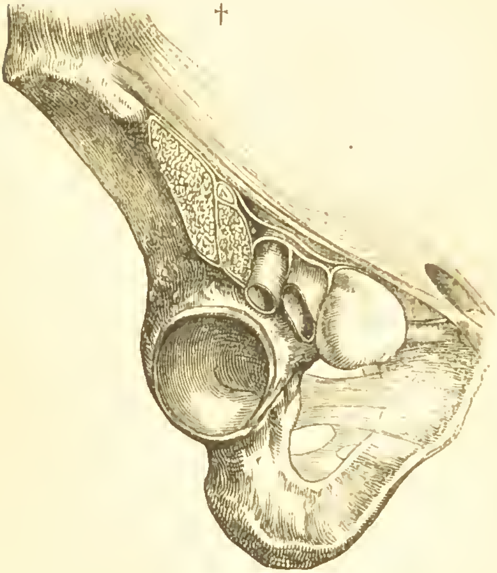
* Luke, Med. Chir. Trans. vol. xxxi. p. 108.

superficial fascia of the thigh, loaded with fat, and divisible into an uncertain number of layers. 3. *Fascia propria*, a layer of cellular tissue derived from the sheath of the femoral vessels, or, according to others, from the *fascia cribriformis* which closes the saphenic aperture. It is in general pretty dense about the neck of the hernia, but thin, or even deficient, on its fundus. 4. The sac. Between the last two there is often found a considerable layer of fat, which might be mistaken for omentum.

Femoral hernia rarely attains a very large size. It is much more frequent in the female than in the male, obviously from the greater breadth of the pelvis.[*]

DIAGNOSIS.—1. Femoral hernia may be distinguished *from the inguinal* by observing that Poupart's ligament can be traced over the neck of the sac, and that the spinous process of the pubes lies internal to it; whereas it is the reverse in the inguinal hernia. Besides, the femoral is generally much smaller and is more frequent in women.


[†]

2. *Psoas abscess* resembles this hernia in its situation, in dilating on coughing, and diminishing when the patient lies down. The points of distinction are, that it is generally more external, that it fluctuates, but does not feel tympanitic, and that it is attended with symptoms of disease of the spine.

3. *Varix of the femoral vein* also resembles this hernia, inasmuch as it dilates somewhat on coughing, and dimi-

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[*] Mr. Partridge informed the author that he had met with a case of femoral hernia, protruding below Poupart's ligament, external to the vessels.

[†] The cut, taken from a preparation of Mr. Fergusson's in the King's College Museum, shows a femoral hernia with its relation to the other parts which pass under Poupart's ligament. Externally are seen sections of the iliacus and psoas muscles, with the crural nerve between them; then the femoral artery and vein; next the hernia, which passes through a small aperture occupied by an absorbent gland in the normal state, and is bounded by Gimbernat's ligament on its inner side. The hernia passes downwards in the sheath of the femoral vessels, separated, however, from the vein, as that is from the artery, by a process of cellular tissue. The sheath of the vessels is continuous above with the fascia transversalis.

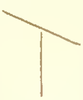
nishes when the patient lies down; but then, if pressure be made below Poupart's ligament, the swelling quickly reappears, although it must be evident that under such circumstances a hernia could not come down.

4. *Bubo and other tumours of the groin* may in most cases be recognised by their general character and history, and by their being unattended with symptoms of inflammation or obstruction of the bowels. But if there be any such swelling, and symptoms of strangulation as well, an incision should certainly be made to examine it; for there may be a tumour that may be satisfactorily proved to be an enlarged gland, and yet there may be a small knuckle of intestine strangulated behind it. Such a case occurred lately to the author's friend and colleague, Mr. R. R. Robinson.

TREATMENT.—1. The *reducible* femoral hernia should be supported by a truss; the pad of which should tell against the hollow which is just inferior and external to the spinous process of the pubes. This hernia is very seldom, if ever, cured radically.

2. The *irreducible* should be supported by a truss with a hollow pad; or perhaps (if it be omental) the pressure of a common pad may be borne.

3. The femoral hernia, when *strangulated*, gives rise to much severer symptoms than the inguinal does, because of the denser and more unyielding nature of the parts which surround the neck of the sac. In performing the taxis, the patient should be placed in the usual position, with the thigh of the affected side much rolled inwards, and crossed over towards the other side. The tumour should first be drawn downwards, from the anterior part of Poupart's ligament, and then be pressed with the points of the fingers backwards and upwards. If, however, the taxis and chloroform do not soon succeed, the operation should be resorted to.

Operation.—In the first place, the skin must be divided. Some surgeons make one simple perpendicular incision. Sir A. Cooper directs one like an inverted ⊥; Mr. Liston prefers making one incision along Poupart's ligament, and another falling perpendicularly from its centre over the tumour, thus:  The skin may be very safely and expeditiously divided by pinching it up into a fold, and running it with its back towards the sac. Mr. Fergusson sometimes makes one like an inverted λ, so that the skin can be turned back in three flaps; after which the succeeding layers may be divided by a simple longitudinal incision. Then the different cellular layers down to the sac must be divided by the bistoury and director, as in the inguinal hernia, and the sac must be opened with very great care, because it is generally very small, and embraces the bowel tightly, and seldom contains any serum or omentum. Then the finger should be passed up to seek for the stricture, which, according to Sir A. Cooper and Mr. Liston, will be generally found to be the *inner edge of the falciform process.* This must be gently divided for a line or two, the incision being directed *upwards and a little inwards*, towards the spinous process of the pubes. It must be recollected, that if this incision were carried too far, the spermatic cord in the male, or round ligament in the female, would be injured. If, however, the stricture is not released by that incision, a few fibres of Gimbernat's ligament must be divided.

The operation without opening the sac, is described by Mr. Luke thus. After premising that the seat of stricture is sure to be at or near the femoral ring, and that it is sometimes caused by bands of fascia propria, half or three-quarters of an inch below the ring; and that the upper boundary of the tumour on the abdominal surface is often marked by a visible depression, or at least that it can be felt by the fingers; "a fold of integuments," he continues, "is to be pinched up at that part, and divided by transfixing it with a narrow knife, so that the incision, when the skin is replaced, shall fall perpendicularly to the body, with its centre opposite to the depression referred to. By a few strokes of the scalpel the tendinous expansion of the abdominal muscles is to be laid bare; after which a finger should be introduced as far as Poupart's ligament, between the tendinous expansion and the tumour, where the latter rises upon the former. The ligament being thus exposed, a hernia-director is guided under it by the finger into the femoral ring, the margin of which may be safely and easily divided in an upward direction with a common probed bistoury, and the taxis applied in the usual way. Should the margin of the ring have formed the stricture, the taxis for the most part succeeds very readily, and the operation is completed in a very short time. But should the stricture be caused by the bands of fascia propria referred to, the director will have passed over them as it entered the femoral ring, in which case any amount of division in an upward direction will be of no avail. When the taxis does not succeed readily, these bands of fascia may generally be suspected to be the cause of failure. The fact may be made sufficiently clear by introducing the finger upon the neck of the sac, under Poupart's ligament, while the body of the sac is pressed between the fingers and thumb of the other hand, when it will be discovered that no impulse is communicated to it by such pressure. By a little attention the bands may be detected crossing the neck of the sac from half to three-quarters of an inch below the ring, and may be divided by insinuating the nail of the fore-finger of the left hand under them from above, and by carrying the point of a probed bistoury along the nail, with its blunt edge towards the sac. The division is made by the surgeon drawing the bistoury away from the sac towards himself, a proceeding which, if properly performed, avoids all danger of wounding the sac or its contents." *

Mr. Gay's Operation.—An incision, rather more than an inch long, is made near the inner side of the neck of the tumour. The superficial fascia having been divided, the forefinger (of the left hand if the hernial tumour is in the right side, and *vice versâ*) is to be passed through this wound, along and close to the side of the hernial tumour, to its neck. On the finger, a *bistouri caché* is to be passed through the cribriform fascia, and through the crural canal, to the ring. "By the least amount of force, and with the aid of a little gentle compression of the inner side of the tumour by the finger, the point of the bistoury may be insinuated between the *sac*, and the pubic margin of the *ring;* the edge of the knife is then to be turned towards the pubes, and by projecting the blade the seat of stricture in that direction may be effectively divided." If, after this, and after the division of any other stricture that may be felt around the neck of the sac, the hernia cannot be reduced, the incision can be enlarged, and the operation of opening the sac as usually directed, be performed.*

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* Med. Chir. Trans. vol. xxxi. p. 112.

SECTION VII.—OF THE UMBILICAL, VENTRAL, AND OTHER REMAINING SPECIES OF HERNIA.

I. Umbilical Hernia—(*exomphalos*)—is, for obvious reasons, most frequent in children soon after birth. It is also not uncommon in women who have been frequently pregnant, although, in many of the so-called umbilical herniæ in adults, the hernial aperture is really not at the umbilicus, but a little on one side of it. The coverings of this hernia are skin, superficial fascia, and sac; they are always very thin, and not unfrequently the sac is adherent to its contents.

Treatment.—If *reducible*, and the patient an infant, the best plan is to place a hemisphere of ivory with its convex surface on the aperture, and retain it there with cross strips of plaster, and a bandage round the belly. A pad of linen, covered with sheet lead, will do as well. But the belly should by no means be bound up too tightly, otherwise there will be danger of producing inguinal hernia. An adult should wear a truss or broad belt, with some contrivance to prevent it from slipping down below its proper level. For the irreducible umbilical hernia, a large hollow pad should be worn. The reduction of this hernia is to be effected by the ordinary manual taxis; but if it be very large, Sir A. Cooper recommends it to be compressed by a wooden platter. If it becomes strangulated, and the patient is aged, and the strangulation was preceded by constipation, purgatives and copious enemata should have a fair trial. If the operation is necessary, an incision three inches in length should be made at the upper part of the tumour through the skin, fascia, and sac, in succession. The stricture should then be dilated directly upwards in the linea alba with the knife recommended in other cases. But perhaps it is better to make the incision so as to divide the under side of the neck of the sac, as advised by Mr. Liston.

II. Ventral Hernia is that which protrudes through the *linea alba*, or through the *lineæ semilunares* or *transversæ*, or in fact through any other parts of the abdominal parietes, save those which are the ordinary seats of hernia. It may be a consequence of wounds or bruises. Its treatment requires no distinct observations; but if it should ever be necessary to operate for the relief of strangulation, care must be taken to avoid the epigastric artery.*

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* On Femoral Rupture, with a new mode of operating, &c., by John Gay, Lond. 1848.

III. Perinæal Hernia descends between the bladder and rectum, forcing its way through the pelvic fascia and levator ani, and forming a tumour in the perinæum.

IV. Vaginal Hernia is a variety of the preceding, in which the tumour projects into and blocks up the vagina, instead of descending to the perinæum.

V. Labial or Pudendal Hernia descends between the vagina and ramus of the ischium, and forms a tumour in one of the labia. It is to be distinguished from inguinal hernia by the absence of swelling at the abdominal rings. These three herniæ must be replaced by pressure with the fingers, and be kept up by pads made to bear against the perinæum, and perhaps by hollow caoutchouc pessaries worn in the vagina.

VI. Obturator or Thyroid Hernia projects through that aperture in the obturator ligament which gives exit to the artery and nerve. In a fatal case related by Mr. Howship, in which a very small piece of intestine was strangulated in this opening, the patient

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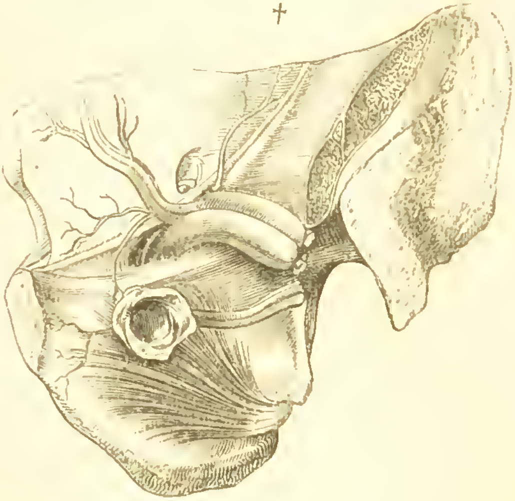

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* Mention is made in the Lond. Med. Gaz., 21st Oct. 1842, of an adipose tumour, situated between the peritonæum and abdominal muscles, and projecting through an aperture in the linea alba, through which it could be pushed back, so that it completely simulated a hernia. Such a case, if complicated with peritonitis, might render the diagnosis very obscure; but an incision would clear up the mystery.

† From a preparation of Mr. Fergusson's in the King's College Museum.

complained of great pain down the leg in the course of the obturator nerve. This might be an aid in the diagnosis. In a case in which Mr. Hilton laid open the abdominal cavity, and disengaged a knuckle of intestine from the obturator foramen, there were no symptoms that indicated the kind of obstruction met with.*

VII. Ischiatic Hernia protrudes through the sciatic notch. This and the preceding are exceedingly rare; and the tumours are of necessity small. If discovered to exist during life, they must be returned and supported by proper apparatus—and if strangulated, the stricture must be divided by operation.

VIII. Diaphragmatic Hernia is generally a result of congenital deficiency, or accidental separation of the fibres of the diaphragm. But it may also be caused by violent falls on the abdomen, or by violent pressure of any kind, capable of lacerating the diaphragm, and driving some of the bowels into the thorax.† This form of hernia, if strangulated, will produce the ordinary symptoms—vomiting, constipation, and pain ; which are not in any manner to be distinguished from the symptoms of ileus or intus-susception—or from those produced when a fold of bowel is entangled in a rent in the omentum, or mesentery ; or when the bowel is constricted by membranous bands resulting from previous inflammation of the peritonæum.

CHAPTER XIX.

OF THE SURGICAL DISEASES AND INJURIES OF THE RECTUM AND ANUS.

I. Foreign Bodies in the rectum sometimes require to be removed by surgical art. They may consist either of small bones or the like that have descended from above, or of pins, glyster-pipes, or other bodies introduced from below. Substances of very extraordinary dimensions (a blacking-bottle, for instance) have been forced into the anus. The grand point is first to dilate the bowel well, by passing in several fingers (oiled) or by means of a speculum ; and then a proper forceps, or a lithotomy scoop, may generally be used with success.

II. Imperforate Anus (*atresia ani*) signifies a congenital closure of the rectum, and may occur in various degrees. The anus may be merely closed by thin, fine skin, which soon becomes distended with meconium ; or the gut may terminate in a blind pouch at any point from the sigmoid flexure downwards, the anal aperture being altogether wanting—or the anus may be open for an inch or two, with an obstruction beyond.

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* This case, like most others, was unfortunately operated upon too late. The obstruction existed from the 20th January to the 1st February. Hilton, Med. Chir. Trans. vol. xxxi. p. 323.

† Reid on Diaphragmatic Hernia, Edin. Med. and Surg. Journ., Jan. and July, 1840.

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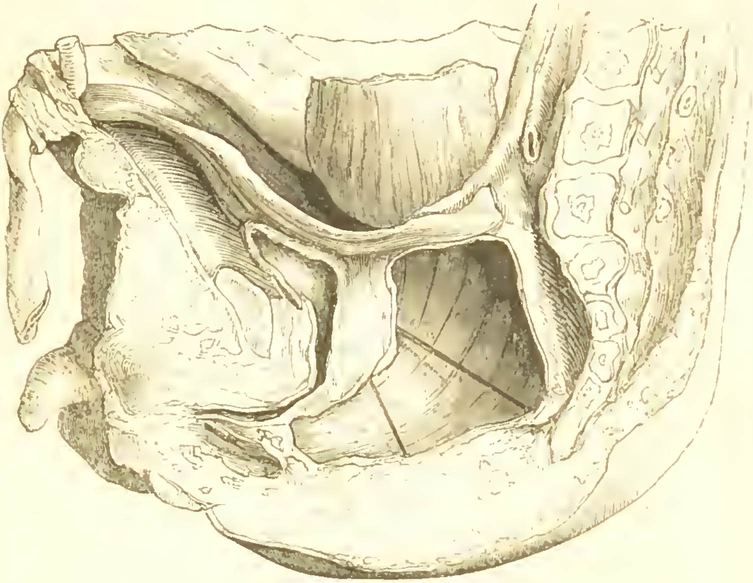

Treatment.—If the end of the intestine can be felt protruding when the child cries, a crucial incision may be made into it without delay—if it cannot be felt, a day or two should be waited, so that it may become distended with meconium, and then a cautious incision should be made with a double-edged bistoury, in the direction of the curve of the sacrum. If it succeed in reaching the bowel, the aperture should be kept open by tents.

But if this operation should fail in reaching the bowel, or if the rectum appears to be altogether deficient, the only resource is the *formation of an artificial anus* in the left loin by Amussat's operation. Vide p. 467.

III. Spasm of the Sphincter Ani is known by violent pain of the anus, with difficulty of evacuating the fæces. On examination, the muscle feels hard, and resists the introduction of the finger. This affection may be caused by constipation of the bowels, or disorder of the health. It may occur in sudden paroxysms which soon go off, or may last permanently, and lead to organic thickening and stricture of the anus.

Treatment.—In recent cases, a dose of calomel and Dover's powder, followed by castor oil, and by enemata of warm water with a little laudanum, will relieve the paroxysm. In more obstinate cases, a bougie or mould candle should be passed daily—alteratives and enemata of warm water should also be administered daily; but if they fail, the sphincter must be divided and made to heal by granulation. *Division of the Sphincter* is easily performed by introducing the forefinger into the anus, and a straight, narrow, blunt-pointed bistoury by its side—and then making an incision of sufficient extent towards the tuberosity of the ischium.

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* Imperforate anus. From the King's Coll. Museum.

IV. HÆMORRHOIDS, or PILES, are small tumours situated near the anus.

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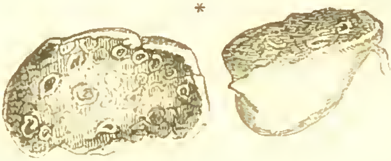

Pathology.—They commence as varicose enlargements of some of the hæmorrhoidal veins; the irritation of which causes various morbid changes in the mucous membrane and cellular tissue adjoining. Sometimes there is a little varicose knot with the cellular tissue around thickened. Sometimes the blood in a dilated vein coagulates, forming a solid tumour with the thickened cellular tissue around. Again, if piles are situated within the rectum, the mucous membrane covering them is liable to become excessively vascular and sensitive, resembling an erectile tissue. They are divided into two species, the internal and external, according as they are situated within the rectum, or external to the anus.

Internal Piles are generally firm tumours, varying in size from that of a pea to that of a walnut, of a pale or reddish-brown colour when indolent, but dark or bright red when congested or inflamed. They generally cause great inconvenience by protruding at each motion, and the hypertrophied vascular mucous membrane covering them is exceeding liable to bleed from the straining and pressure.

External Piles may be met with, 1. in the form of round hard tumours just at the margin of the anus, and covered half with skin and half with mucous membrane; or 2. of oblong ridges of skin external to the sphincter. These are commonly called *mariscæ*, or blind piles, because they do not bleed.

Symptoms.—Piles may be met with in two states—*indolent* or *inflamed.* When *indolent*, they merely produce the inconveniences that necessarily result from their bulk and situation, and pain from getting within the gripe of the sphincter. When *inflamed*, they occasion the following symptoms: Pain, heat, itching, fulness, and tension about the anus—a sensation as if there were a foreign body in the rectum—pain and straining in passing evacuations—with perhaps more or less bleeding. These symptoms may, in violent cases, be complicated with irritation of the bladder, frequency of micturition, pain in the back, pain and aching down the thighs. The young surgeon should remember, that a patient with piles may not be aware of the nature of his complaint, or through delicacy may abstain from mentioning it. Whenever, therefore, a patient complains of unusual irritation of the bladder, or of symptoms of dysentery—that is to say, frequent, painful, and unsatisfactory efforts to pass motions, the surgeon should always make inquiries after piles. In women, piles may cause aching of the back, uterine irritation, with mucous discharge, and many anomalous symptoms, which the surgeon will in vain endeavour to cure until he finds out the real cause. The hæmorrhage from piles will be treated of more particularly at page 494.

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[*] Piles after excision, showing the dilated veins, of which they are in a great measure composed.

Causes.—The *predisposing causes* are any circumstances that produce fulness of the abdominal vessels, or that impede the return of blood from the rectum—such as luxurious and sedentary habits of life—pregnancy, constipation, disease of the liver or lungs retarding the passage of blood through them, and tight stays. The *exciting causes* may be anything that irritates the lower bowels—particularly straining at stool—large doses of aloes—ascarides—horse exercise, and the application of cold and damp to the posteriors. Piles are most frequent in women, and are rare under puberty.

General Treatment.—The grand objects are to remove the predisposing and exciting causes. The patient, if stout, plethoric, and of sedentary habits, ought to live abstemiously, and take plenty of exercise. The bowels should be regulated by some mild aperient, capable of producing daily copious soft evacuations without straining or griping. Senna, sulphur, cream of tartar, and magnesia, in the form of electuaries, F. 46, are frequently used for this purpose; or pills of rhubarb and soap, with ipecacuanha, taken twice a day, F. 52; or a small dose of castor oil or Rochelle salts in the morning. It is a good plan to inject the rectum with cold water both before and *after* the motions, and to use a hip-bath at 85—70° at bedtime. In cases of long standing, in which the mucous lining of the rectum is relaxed, cubebs, or Ward's paste, or the confect. piperis comp. may be given with great benefit in doses of ʒj ter die. In similar cases, especially if the patient is advanced in years, and the piles are attended with a flow of mucus, copaiba may be given in the dose of thirty or forty drops every morning in milk; and a scruple of common pitch may be taken in pills every night at bedtime. Old people rarely dislike the taste of copaiba. Arsenic, which seems to act specifically on the rectum, is recommended by Mr. C. Hawkins.*

If the *piles are inflamed*, leeches to the anus, or cupping on the sacrum, a dose of calomel and opium at bedtime, followed by castor oil in the morning; low diet, rest in bed, warm fomentations and poultices; and enemata of warm water, if the anus is not too tender to bear the introduction of the pipe, are the requisite measures. Cold lotions of lead (with a little laudanum) may be substituted for the warm applications, if more comfortable. If there is a tense bluish solid tumour, evidently containing coagulated blood, it *may* be punctured; but perhaps it is bettter not to do so.

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* Med. Gaz. N. S. vol. v. p. 139.

Local Treatment.—1. The first and most essential measure is *perfect cleanliness.* Mr. Mayo directs the anus to be well washed with *yellow soap* and water after each motion—and if the piles are internal, and protrude during evacuations, they should be washed before they are returned. 2. *Astringents*—the zinc lotion, F. 117; or iron lotion, which is particularly recommended by Mr. Vincent, F. 128; or unguentum gallæ, to which latter a little of the liq. plumbi diac. may be advantageously added, F. 162, are generally of benefit. Dr. Burne recommends an ointment composed of pulv. hellebori nigri ʒj adipis ℥j, which he says never fails of affording great relief, although exceedingly painful for a time. 3. *Pressure* by means of a bougie introduced occasionally—or a pad of ivory with or without a spring, made to bear against the anus with a T bandage, are often of service. There is an instrument consisting of a short egg-shaped ivory bougie, which is introduced into the anus, and which is attached by a slender neck to an ivory pad—so that pressure is thus made both internally and externally, that is extremely useful in cases of internal piles with relaxed mucous membrane, and tendency to prolapse.

But probably the most speedy and effective means of affording relief in cases of internal piles is the *nitric acid* which was originally recommended by Dr. Houston in order to destroy the tender, tumid, and bleeding surface of mucous membrane which covers them, and which is the source of their excessive irritability and hæmorrhage. The bowel having been protruded, the diseased surface is to be wiped with lint, and then, a portion of it, the size of a sixpence, to be smeared with a smooth wooden stick dipped into the concentrated acid; and then pure olive oil, or hog's lard, is to be applied copiously, in order to prevent the caustic being too widely diffused, and the parts to be returned within the sphincter. The patient should go to bed, and the bowels be kept quiet by opium for forty-eight hours; and when the slough caused by the acid separates, the surface generally cicatrizes speedily, and leaves the part braced up by its contraction. It is difficult to exaggerate the benefits of this plan of treatment. It seldom causes pain or any ill consequence. The author has by two applications of it, relieved a patient permanently of pain and hæmorrhage which had lasted for years, and which on the average caused the patient to lose two hours' time every morning, by rendering him incapable of attending to anything save his own miserable sensations. A few days after the use of the acid, the patient should inject a drachm of Vincent's iron lotion, F. 128, every day after defæcation. We may add, that Mr. Fergusson has invented a *speculum ani*, made of glass, silvered, and covered with a smooth preparation of India rubber, and having a hole in one side, through which the acid can be very conveniently applied.*

Extirpation.—If the preceding measures fail, the piles must be extirpated. Piles, if external, may be removed by excision with the knife or scissors; if internal, they should be removed by ligature, for excision of them might occasion a fatal hæmorrhage.† But the surgeon must bear in mind that it is highly dangerous to operate upon internal piles if the health is broken, or if there is any organic disease of the liver or kidneys; and the operation must be both preceded and followed by a course of the most regular diet, and medicines to maintain the secretions, and remedy any disorder in the health.

The operation is performed as follows: The bowels having been previously well cleared, the patient must be told to protrude the piles; and if he cannot do it easily, he should sit over a vessel of warm water, or have an enema of warm water. Then the piles should be drawn out with a tenaculum, and a ligature (not too fine) be tied as tightly as possible round the base of each. If one of the tumours is large, a double ligature may be passed through its base with a needle, and either half be tied separately. Before finally tightening the ligatures, the piles should be slightly punctured. After the operation, the ends of the thread should be cut short, and be returned into the rectum. The patient should remain in bed, and the bowels should not be disturbed for forty-eight hours after the operation. Pain is to be relieved by an opiate, F. 32; and if it persist, the piles should be examined to see whether the ligatures remain as tight as possible, and if not, they should be reapplied.

V. WARTS, CONDYLOMATA, and other excrescences around the anus, that arise from local irritation, are to be removed with the knife, and the surface from which they grew should, during the granulating stage, be treated with astringent lotions.

VI. HÆMORRHAGE from the rectum is a very frequent concomitant of piles, and may be of two kinds. In the first place it may be caused by the bursting of a varicose vein; in which case the blood is venous; and the hæmorrhage in general occurs only at unfrequent intervals. But far more frequently it proceeds from the vascular surface of internal piles; which gives way under the straining which accompanies defæcation. In the latter case the blood is arterial: it is squirted from the anus in jets, when the patient is straining at the water-closet, and the bleeding occurs very frequently, especially when the body is feverish, or the piles inflamed. Hæmorrhage from the rectum may be distinguished from that which has its source higher up, by noticing that the blood is generally of a florid hue, and that it covers the fæces, but is not intimately mixed with them.

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* See an account of Dr. Houston's method in Dublin Med. Journ., March, 1843; Fergusson, Pract. Surg. 2nd Ed. p. 595. See also a very good paper by H. Lee, Med. Gaz., 1848.

† If the surgeon is determined to excise internal piles, the only safe way of doing so is as follows:—When the tumour is protruded, the base of it should be transfixed by a long needle, which will prevent it from returning into the anus. Then it may be cut off; and the cut surface being exposed to the air, will not bleed so profusely; or if it does, it is easy to apply cold, astringents, or ligatures.

Treatment.—1. If the hæmorrhage is moderate in quantity, if it has been of habitual or periodic occurrence, if it induces no weakness, and if it brings relief to pain in the head, or any other feeling of disorder, before suppressing it the patient must be made to adopt a course of exercise, temperance, and alterative and aperient medicines, with the view of removing the state of plethora that accompanies it. 2. But if the patient is weak and emaciated; if the lips are pale, and the pulse feeble, the bleeding should be at once suppressed. (We may observe here, that whenever a patient applies for relief in consequence of violent palpitations and shortness of breathing, or giddiness and swimming in the head; if the lips are pale, and the extremities tend to swell, the surgeon should always inquire for piles, because, as we before observed, some patients, through false delicacy, will not mention them.) Or if the bleeding, as sometimes happens, instead of relieving symptoms of heat and fulness in the rectum, aggravates them, the bleeding should also be stopped, whatever the patient's complexion may be; and if he is of a full habit, he should live abstemiously, and keep the bowels open with Seidlitz powders. The means of checking hæmorrhage from the rectum are, 1. That piles, if any exist, should be cauterized with nitric acid, or be tied. 2. Astringent applications, such as injections of dec. quercus, or F. 128, used cold. 3. The internal remedies most likely to be of service are salts of iron, or bark with sulphuric acid, or the balsams of copaiba and Peru. F. 9, 13, 14, &c.

VII. Discharge of Mucus—clear and viscid—without fæcal odour, may be caused by piles, ascarides, the use of aloes, or any other causes of irritation to the rectum. To be treated by mild aperients, astringent injections, and copaiba or cubebs. F. 37, 39, 13, &c.

VIII. Abscesses near the rectum may be caused by the irritation of foreign bodies, or by caries of an adjacent bone, but they are much more frequently the result of the various causes of disordered circulation in the hæmorrhoidal vessels that were mentioned as producing piles, and especially of that morbid state of mucous membrane which accompanies pulmonary tubercle. They may either be large and deep-seated, or small and superficial. 1. Deep-seated abscesses are attended with great aching and throbbing, difficulty and pain in evacuating the fæces, and fever, and on internal examination a fulness or fluctuation may be felt. If these abscesses are left to themselves, a vast quantity of matter may accumulate in the loose cellular tissue of the pelvis, and severe irritative fever result from its confinement. 2. Superficial abscesses are attended with more or less pain, tenderness, and throbbing, and swelling around the anus. They are often chronic, and often occur in the consumptive.

Treatment.—Leeches and fomentations may be tried at first, but if they do not very soon remove the pain and tenderness, or if there is the least suspicion that matter is forming, a bistoury should be pushed home into the inflamed part, and if it be at all extensive, two or three punctures should be made.

IX. FISTULA IN ANO signifies a fistulous track by the side of the sphincter ani. It is extremely difficult to heal, both because the constant contractions of the sphincter and levator ani interfere with the union of its sides, and because of the passage of fæcal matter into it from the bowel. There are three kinds spoken of in books. 1. The *complete fistula*, which has one external opening near the anus, and another into the bowel above the sphincter, where it may be felt like a small papilla. 2. The *blind external fistula*, which has no opening into the bowel, although it mostly reaches its outer coat. 3. The *blind internal fistula*, which opens into the bowel, but not externally, although its situation is indicated by a redness and hardness near the anus.

This affection is a common result of abscess by the side of the rectum. Brodie's opinion is, that it always commences with an ulceration of the mucous membrane of the rectum, and an escape of fæcal matter into the cellular tissue; which gives rise to abscess, and the abscess to fistula. But most other surgeons believe that it may be the result of abscesses around the anus, which have no connection with the rectum. Besides, there may be openings near the anus, leading from the tuber ischii, which may be carious.

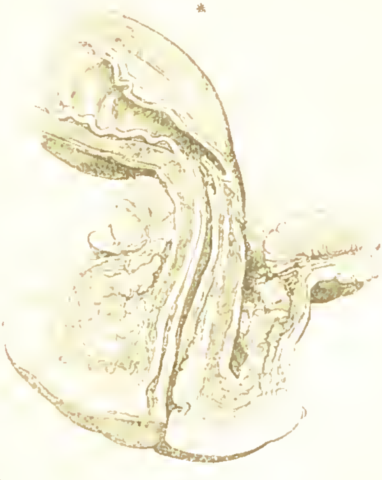
Treatment.—The grand remedy for this affection is division of the sphincter ani, so as to prevent contraction of that muscle for a time, and cause the fistula to heal from the bottom. The digestive organs and secretions must first be put in good order, and the bowels be well cleared by castor-oil and an injection, so that they may not want to be disturbed for two or three days. *Operation.*—The patient being placed on his knees and elbows on a bed, or being made to kneel on a chair and lean over the back of it, and the nates being kept asunder by an assistant, the surgeon introduces his left forefinger into the anus, and at the same time explores with a probe the whole extent and ramifications of the fistula. If it is of the *blind internal* kind, its situation must be ascertained, and a puncture be made into it by the side of the anus. Perhaps a probe bent at an acute angle may be passed into it from the bowel, and serve as a guide for the puncture. Then, one forefinger being still in the anus, the surgeon passes a strong curved probe-pointed bistoury up to the further end of the fistula. Next (if the internal opening cannot be found) he pushes it through the coats of the bowel, so that its point may come in contact with his forefinger. Then he puts the end of his forefinger on the point of the bistoury, and draws it down out of the anus; and as soon as it is fairly emerged, he pushes the handle towards the orifice of the fistula, so as to divide skin, sphincter, and bowel, at one sweep. Sir B. Brodie recommends that the bistoury should always be passed through the internal opening of the fistula, and says that the affection will very likely return if this is not divided; he also condemns the practice of cutting through the bowel higher up than this opening. A few threads of oiled lint are then to be placed in the wound, and the patient to be kept in bed for three days. The subsequent treatment consists in the use of perfect cleanliness, and the daily introduction of a very little slip of lint (which may be dipped in some stimulating lotion if necessary) between the edges of the wound for the first few days, so as to prevent its edges from uniting, and to cause it to granulate from the bottom. If hæmorrhage prove violent after this operation, and does not yield to the application of cold, the anus must be well dilated with a speculum, so as to expose the bleeding surface to the air, and any artery discernible may be tied; or else it may be firmly plugged with lint, which is to be secured by a T bandage.

If the patient will not submit to this operation, or if he is labouring under disease of the lungs or liver or kidneys, in an advanced stage, so that it would be unsafe, the treatment must be *palliative* merely. The confect. piperis, or copaiba and tonics, may be administered internally, and stimulating injections and ointments be applied to the fistula; but they will rarely be of any avail.

X. Rhagades—fissures and excoriations about the anus—produce the utmost pain during the passage of evacuations, and if neglected may lead to spasm and permanent stricture of the sphincter.

Treatment.—Aperients and alteratives, regular diet, astringent applications, such as decoction of rhatany, zinc lotion, borax and honey, or mercurial ointment, or ung. hydr. nitrat. dilut., to which a little ext. belladon. should be added if there be much pain or spasm of the sphincter, and the strictest cleanliness. But if a fair trial of these measures is unavailing, the sphincter must be divided.

XI. Prolapsus Ani consists in an eversion of the lower portion of the rectum, and its protrusion through the anus. Sometimes a little fold of the mucous membrane only protrudes; but in ordinary cases the muscular coat, and whole thickness of the bowel, come down. This affection is most common in infancy and old age. It may depend on a natural laxity and delicacy of structure, or be caused by violent straining, in consequence of costiveness, or of the existence of piles, or stone, or stricture.



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* This cut, from a preparation in the King's College Museum, shows a section of a prolapsed rectum—the whole circumference of the lower part of the bowel being everted and extruded. The mucous membrane is excessively thickened from the irritation of exposure.

Treatment.—Whenever the protrusion occurs, the parts should be carefully washed, and then be replaced by pressure with the hand. If there is any difficulty in doing so, the forefinger oiled should be pushed up into the anus, and it will carry the protruded part with it. If, however, as sometimes happens, a larger portion than usual has come down, and it is so swelled and tender from the constriction of the sphincter, and from being irritated by the clothes, that it cannot be returned, leeches, fomentations, a dose of opium, and rest in the horizontal posture for some hours, will remove the difficulty; but plain iced water is perhaps the best application. To cure this affection radically, the bowels should be regulated by gentle aperients (F. 46, 52, 55), so as to prevent costiveness and straining, injections of dec. quercus, or of a lotion composed of a drachm of muriated tincture of iron to a pint of water; sponging with cold water—tonics, especially steel wine—the occasional passage of a bougie, and support by pads and T bandages, may be used to give tone and firmness to the parts—and piles, or any other source of irritation, must be removed by appropriate remedies. Dr. MacCormac of Dublin recommends that when the stools are passed, the skin near the anus should be drawn to one side with the hand, so as to tighten the orifice; this the author believes to be a very valuable suggestion. But if the diligent employment of these measures is of no avail, certain operations may be resorted to. 1. The mildest consists in pinching up two or three folds of mucous membrane on the protruded bowel with forceps, and tying them tightly with ligatures. 2. Or ligatures may be passed by needles through several folds of skin just at the margin of the anus, which are then to be tied up tightly. Or 3, a small patch of relaxed mucous membrane may be destroyed by acid. Either of these operations may be repeated as often as necessary. Their effect in producing adhesion and consolidation of the relaxed tissues must be obvious. There is a French operation, which consists in excising a portion of the sphincter ani; but when this operation used to be performed (as it commonly was sixty years ago) for fistula, it was often followed by inability to retain the fæces.

XII. INTERNAL PROLAPSUS.—Sometimes the upper part of the rectum becomes prolapsed and invaginated within the lower, giving rise to most of the symptoms of stricture. On examination with the finger, the canal of the rectum is found obstructed by a tumour with a capacious *cul de sac* around it, and with the natural passage of the bowel in its centre.

Treatment.—Aperients, mild astringent injections, and the bougie; the point of which should be carefully guided into the orifice in the centre of the prolapsed portion.

XIII. SPASMODIC STRICTURE of the rectum—known by great difficulty in evacuating the bowels, with spasmodic pain on doing so—is an affection about which but little is known. "It generally depends," says Mr. Mayo, "on a vitiated state of the secretions; and is more frequently relieved by a regulated diet and alterative medicines, and the use of injections, than by the employment of the bougie."

XIV. Permanent Stricture.—In this affection there is a chronic thickening and contraction of the mucous coat of the rectum, so as to form a ring encroaching on its canal. It is generally situated at from two inches and a half to four inches from the anus. More rarely it is met with higher up, or even in various parts of the colon. It may follow the contraction of cicatrices of ulcers. The *symptoms* are great pain, straining and difficulty in voiding the fæces, which are passed in small, narrow, flattened fragments: and on examination the stricture may in ordinary cases be readily felt. Irritation of the bladder and uterus, and pains or cramps in the leg, with headache and dyspepsia, are occasional additional symptoms. If this affection be unrelieved, it leads to ulceration of the rectum above the stricture, with a consequent aggravation of all the symptoms, and death from irritation.

Treatment.—The remedies are aperients and injections so as to produce daily soft unirritating stools, and the bougie. A soft bougie, capable of being passed with moderate facility through the stricture, should be introduced once in three or four days, and be allowed to remain fifteen or twenty minutes; and its size should be gradually increased when a larger one admits of being passed. The best bougie is a short one, made of India rubber, which may be received altogether within the sphincter; and it may be withdrawn by means of a ribbon at one end. Instruments of every sort introduced into the rectum should be handled with the utmost gentleness. Nothing is gained by forcing a large bougie through a stricture. The cure is to be effected by the repeated and gentle stimulus of pressure, so as to excite absorption, not by mere mechanical dilatation. There are numerous fatal instances on record in which the bowel has been torn by bougies, and by that most dangerous and loathsome instrument, the common clyster syringe, in the hands of careless or ignorant people. For the administration of enemata, the pipe should be only an inch and a half in length, with a large bulbous extremity. Or if in cases of stricture, or of obstinate costiveness with great accumulation of fæces, or of incarcerated hernia, it is desirable to introduce a tube farther, it should be quite flexible like that of a stomach-pump. But the natural sharp fold at the junction of the rectum with the sigmoid flexure, and the fact shown by Mr. Earle that the bowel not unfrequently makes a horizontal curve to the right before descending into the pelvis, render the introduction of bougies into the sigmoid flexure a very blind, hazardous proceeding, and one that is not often to be justified. Moreover the surgeon must be on his guard lest he fall by inadvertence into an error, which some vile mercenary men daily commit on purpose. That is to say, he must not pronounce his patient to have a stricture merely because the point of the bougie catches in the folds of the mucous membrane, or is obstructed by the promontory of the sacrum.

XV. SIMPLE ULCER of the rectum is generally situated on its posterior surface, just above the sphincter, where it may be felt with a slightly indurated edge. It generally begins as a small crack or fissure of the mucous membrane, caused by straining to get rid of hardened fæces. It produces great pain and difficulty of defæcation; more or less discharge, occasionally tinged with blood, and irritation of the bladder.

Treatment.—Laxatives, enemata of warm water, to which a little laudanum may be added when there is much pain, and the application of a solution of arg. nit. to the ulcer, or the introduction of tents of lint smeared with mercurial ointment, which failing, the sphincter must be divided and made to heal by granulation.

XVI. MALIGNANT DISEASE of the rectum is usually of the scirrhous variety, and situated at first about two or three inches above the anus. It may either commence as a distinct tumour, or as an infiltration of some part of the walls of the bowel. The earliest symptoms are uneasiness in the rectum, with a sense as if some fæcal matter had lodged there; aching and pain in the back hips and thighs, and irritation of the bladder. As the disease advances, the bowel becomes more or less obstructed; there is frequent discharge of a fetid muco-purulent matter streaked with blood; and there is a most obstinate constipation, attended with enormous swelling of the abdomen, and sometimes with all the symptoms of strangulated hernia; but this may alternate with the most profuse and exhausting diarrhœa. Abscesses about the rectum, opening perhaps into the bladder or vagina, aggravate the patient's misery, and death ensues from exhaustion, or from peritonitis, or perhaps from rupture of the distended bowels. This disease is to be distinguished by examination with the finger, or with the speculum; which will detect hardening and ulceration, or perhaps fungating tumours blocking up the gut.*

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* In a case related to the author by Mr. Mayo, of Winchester, ulceration of the anus, of the worst syphilitic character, laid open the peritonæum between the rectum and vagina: a portion of omentum protruded: it was imperfectly replaced, as it was supposed, naturally enough, to be a prolapse of the rectum, and the patient died with symptoms of strangulation.

Treatment.—The first object is, to keep up the action of the bowels by enemata of warm water, and by the mildest laxatives; and to allay irritation by occasionally leeching the sacrum; by belladonna and opiate plasters; or occasional enemata, or suppositaries of opium, or large doses of henbane or conium; and by the tepid hip-bath. Sir B. Brodie recommends injections of linseed oil, either pure or mixed with lime water, and balsam of copaiba with alkalis internally. When the obstruction threatens to become considerable, it will be expedient to use bougies, very gently, of the softest materials, and not more frequently than is absolutely necessary. When these fail, it may be expedient as a temporary resource, to cut through, or to excise some portion of the obstructing growth; some surgeons have even extirpated the lower extremity of the rectum; but all these operations can only be regarded in the light of palliatives. As a last resource, an artificial anus may be formed by Amussat's operation.*

XVII. Pruritus Ani, a very violent itching of the anus, is a very troublesome affection. The best plan is, to keep the bowels open with sulphur, seidlitz powders, or castor oil, with occasional doses of blue pill; to put the stomach in proper order; to bathe the part very frequently with water as hot as can be borne; and to apply some stimulating or astringent substance, such as nitrate of silver, weak solution of corrosive sublimate, the citrine ointment, or lemon juice. The liq. arsenicalis may be tried in an obstinate case.

CHAPTER XX.

OF THE DISEASES OF THE URINARY ORGANS.

SECTION I.—OF RETENTION OF URINE FROM SPASMODIC STRICTURE OF THE MALE URETHRA.

Retention of Urine.—This term signifies want of power to pass the urine from the bladder. The student must make himself aware of the distinction between this and the *suppression* of urine; in which latter case, there is no urine secreted by the kidneys, and the bladder is consequently empty. He should notice also the important fact that an involuntary dribbling of urine often occurs when the bladder is full almost to bursting, and that this is no sign that there is no retention.

Causes.—Retention of urine may be caused by morbid conditions of the urethra, including spasmodic and permanent stricture, contraction of its orifice; the impaction of stones or other foreign bodies in it; and the presence of cicatrices, abscesses, tumours, and fractured bones external to it; by disease of the prostate; and by palsy of the bladder.

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* Walshe, op. cit. p. 297.

Of stricture there are three varieties; 1, the *permanent* or *organic stricture*, in which the urethra is contracted and condensed from chronic inflammation; 2, the spasmodic stricture arising from spasm of the muscular fibres which surround the membranous portion; and 3, this in certain cases is combined with some degree of acute inflammation, whence the term *inflammatory stricture.*

SPASMODIC STRICTURE depends on spasm of the muscular fibres* which surround the membranous portion of the urethra. It generally affects persons who are labouring under some degree of permanent stricture, or whose urethra has been rendered irritable by repeated attacks of gonorrhœa, or by a diseased condition of the urine (especially a tendency to phosphatic deposits); these therefore are the *predisposing causes.* The usual *exciting causes* are, exposure to cold and wet, and indulgence in punch or champagne, or similar acid liquors, which disorder the stomach and render the urine unusually irritating. Hence an attack of spasmodic stricture generally comes on about four hours after dinner. It may also be caused by cantharides, whether taken by the mouth, or absorbed from blisters applied to the skin.

The *symptoms* are,—sudden RETENTION OF URINE; that is to say, the patient finds himself suddenly unable to pass his water, although he has a great desire and makes repeated straining efforts to do so. The bladder soon becomes distended, and can be felt as a tense round tumour above the pubes, and unless relief is given, the countenance becomes anxious, the pulse quick, and the skin hot. The straining efforts at micturition also become more frequent and violent, and the distress and restlessness are extreme. In this way, if unrelieved, the patient may perhaps go on for three or four days; a little urine passing occasionally when the spasm is less urgent, but the bladder still remaining loaded; till at last either the bladder bursts into the peritonæum; or, as more frequently happens, the urethra behind the stricture (which of course becomes dilated and weakened under the pressure of the urine impelled by the whole force of the abdominal muscles) bursts into the perinæum, and gives rise to *extravasation of urine*, as will be described in the third section.

The *inflammatory stricture* is a variety of the preceding, in which great pain and tenderness of the perinæum, and fever, are combined with spasm. It is generally caused by abuse of injections, or by exposure and intemperance during acute gonorrhœa. The treatment of this and of the spasmodic variety must be the same.

Treatment.—In the first place the bladder must be relieved if possible. A silver catheter may first be introduced. But if that fails to pass, the surgeon may try a gum catheter of the smallest size, which has been kept for some time on a curved wire, so that it retains its curve when the wire is withdrawn. If that also fail, a catgut bougie, or a common bougie, may be tried in succession, the surgeon endeavouring to get them within the gripe of the stricture; after which if they are withdrawn, a stream of urine will generally follow. In introducing either of these instruments, the surgeon should be careful, 1st, to draw the penis well forwards on it, so as to stretch the urethra, and prevent the instrument from becoming entangled. 2ndly. To make the point slide along the upper surface of the urethra. 3rdly. On meeting with the obstruction, to press against it steadily, but very gently. And by one or other of these means, used with delicacy and perseverance for five or ten minutes, the stricture will in most cases be made to yield.* The size of the instruments employed should vary according to the duration of the disease; being small if that is of long standing; but larger if it is only of recent formation.

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* Particularly described by Mr. Guthrie in his work on the Urinary and Sexual Organs, 3rd ed. Lond. 1843.

If, however, they all fail, certain remedies for relaxing the spasm must next be resorted to; such as,

(*a*) Venæsection, or cupping from the perinæum—if the patient is of a plethoric habit, and complains of much pain; (*b*) An enema, or some purgative of speedy operation—if the attack is caused by excess at table; followed by (*c*) an enema of solution of starch f℥iii with tinct. opii f ʒ i, or by repeated doses of opium or Dover's powder; together with (*d*) immersion of the whole body in a warm bath, are the most useful. But there are many others that are often of very great service; especially (*e*) the *tinct. ferri sesquichloridi* in doses of ♏x every ten minutes—(*f*) affusion of cold water on the genitals—(*g*) large draughts of lime water—(*h*) and belladonna smeared on the perinæum. (*i*) A slight touch with the caustic bougie sometimes produces immediate relief, when there is some degree of permanent stricture, which is exceedingly irritable, and liable to frequent spasm. (*k*) Quinine has cured cases in which spasmodic stricture occurred periodically.

But the most generally useful remedy of all, is opium or chloroform; either of which will allay the extreme anxiety of the patient, and stop his repeated strainings; for the stricture generally relaxes when it is relieved from the constant pressure of the urine against it.

Puncture of the bladder.—If none of these means succeed, and the bladder has become exceedingly distended, it must be punctured. But this operation, although sometimes necessary to save life, is not very frequently performed. The time at which it must be done must be decided by the surgeon's judgment; sometimes, as Sir B. Brodie observes, it is necessary within thirty-six hours, sometimes not for three or four days. The puncture may be made in three places, viz. 1, by the rectum, 2, above the pubes, or 3, the urethra may be opened in the perinæum. The first operation is preferred by some surgeons in cases of retention of urine by stricture, but is very seldom performed; the second is needful when the prostate is enlarged so as to render puncture by the rectum impossible; and the third when urine is extravasated, and in most cases of impassable stricture.

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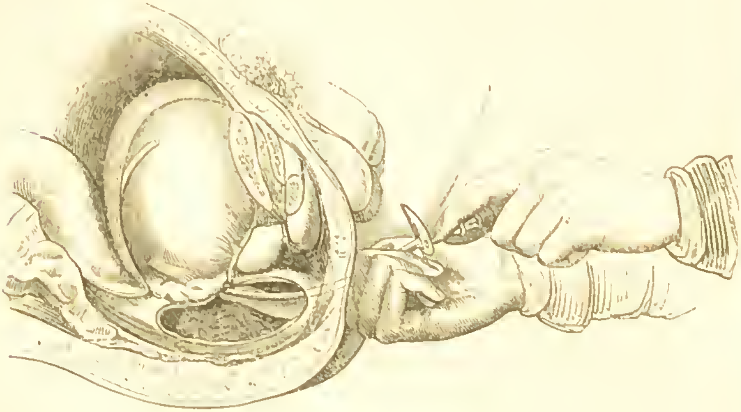
* The surgeon should always pass the instrument through the palm of his hand, before introducing it into the urethra, to make sure that it is smooth and fit for use.

PUNCTURE OF THE BLADDER BY THE RECTUM is performed by placing the patient on his hands and knees, or placing him on his back with his knees drawn up, and bringing him close to the edge of the bed, introducing the right fore-finger into the anus, and a long curved trocar and canula, by its side, then feeling for the distended bladder just behind the prostate, and exactly in the middle line, and plunging the trocar into it—leaving the canula for four-and-twenty hours. The point of the trocar should be withdrawn slightly within the canula as it is being introduced into the anus.



SECTION II.—PERMANENT STRICTURE.

PERMANENT STRICTURE signifies a contraction of the urethra, caused by chronic inflammation. At first, a small portion of the mucous membrane, perhaps only a line or two in extent, is found thickened and deprived of its natural elasticity; and perhaps contracted so as to form a sharp fold, as if it had been tied with a thread. But in old neglected cases, the canal with the *corpus spongiosum* around may become converted into a thick, gristly, cartilaginous mass several inches in extent. Out of ninety-eight specimens, Mr. H. Smith found the disease situated in the membranous portion in twenty-one, whilst in seventy-seven it was anterior to the triangular ligament, and chiefly either in the bulbous portion of the canal, or in front of it. The *causes* are repeated gonorrhœa, intemperance, and unhealthy conditions of the urine.

Symptoms.—In what may be called the *first stage*, the patient finds that he wants to make water oftener than usual, and that he has more or less uneasy sensation in the perinæum after doing so; he also notices that a few drops hang in the urethra, and dribble from him after he has buttoned up. Then he observes that the stream of water is smaller than usual, and forked, or scattered, or twisted, and that he requires a longer time and greater effort than usual to pass it. Itching of the end of the penis and gleety discharge are not unfrequent concomitants if the stricture is near the anterior extremity of the urethra.

If the disease proceeds to its *second stage*, the bladder becomes irritable, obliging the patient to rise in the night to void his urine. He is liable to attacks of spasms with complete retention, as was described in the preceding section. In one of these. the urethra may ulcerate or burst, giving rise to urinary abscess, or to extravasation of urine, as will be described in the next section. Rigors occurring in paroxysms like ague fits are not uncommon.

Finally, if the complaint is permitted to continue, the health suffers from the constant irritation and want of sleep; the bladder and kidneys become diseased; the complexion becomes wan; the appetite fails; the patient complains of chills and flushes, of aching and weakness in the back, and of great languor and depression of spirits; and the urine is constantly loaded with fetid mucus. After death, the urethra behind the stricture is found greatly dilated; the prostate, with its ducts dilated, and in a state of suppuration, or perhaps containing small circumscribed abscesses; the bladder, sometimes dilated, but more frequently contracted and having its muscular coat enormously thickened; sometimes sacculated from a protrusion of its mucous coat between the fibres of the muscular; the ureters dilated, and converted into subsidiary receptacles for the urine, and the kidneys either greatly dilated or disorganized. An engraving illustrative of this will be found in the seventh Section of the present chapter.

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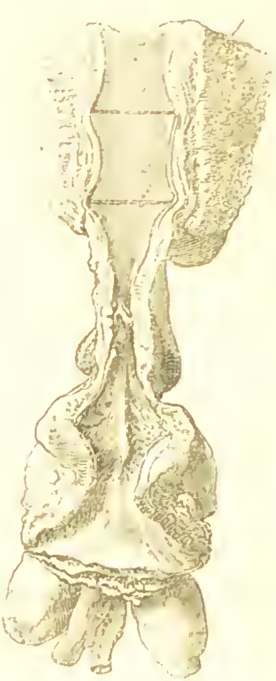

Treatment.—In the first place, any disorder of the general health, or of the digestive organs, and any derangement of the urine, must be corrected by proper remedies. (Vide Gleet, Chronic Inflammation of the Bladder, and Urinary Deposits.) The patient also must avoid violent exercise, especially on horseback. But the stricture can only be cured by *mechanical means.* And these are five: 1, The bougie; 2, the catheter kept in the urethra; 3, the caustic bougie; 4, puncturation with the stilette, and, 5, division from the perinæum.

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[*] This drawing, from a preparation in the King's College Museum, shows the urethra laid open, and a stricture in the membranous portion just in front of the verumontanum.

1. *The bougie.*—In order to ascertain with precision the existence of stricture, the urethra should be examined with a common plaster bougie of full size, *i. e.*, one that will readily enter the orifice, and that will fill the urethra without stretching it. The surgeon takes the corona glandis in his left hand, and introduces the bougie (previously oiled and bent to the shape of the urethra) with his right—holding it loosely like a pen. If it meets with an obstruction, it should be slightly withdrawn, then tried again. If it now seem to pass, the surgeon should relinquish his hold, and then if it recoils, it is a sign that it has bent against the stricture; whereas if it has entered the stricture it will be held, and will require a gentle force to dislodge it. If after all it does not pass, a metallic sound or catheter may be tried, because a slight obstacle to the instrument at its first introduction must not be set down at once as stricture. The patient generally suffers somewhat from sickness and faintness on the first trial. When the stricture is clearly made out, the surgeon should mark and lay by a bougie that will just pass through it. In three or four days' time he introduces the same bougie again, lets it remain a few minutes, then withdraws it, and introduces another of a size larger, which he suffers to remain for ten or fifteen minutes. After three more days the process is repeated, first using the instrument that was passed, on the former occasion, then one of a size larger; and this process repeated a sufficient number of times affords in most cases an easy, painless cure. In any case in which great pain or irritation attends the process, the patient may be put under the influence of chloroform.

Metallic bougies or sounds made of silver, or steel plated, are to be preferred to those of the ordinary soft materials, 1st, if the stricture is old and very hard and gristly; 2ndly, in cases of very irritable urethræ, because their smooth polished surface is not so apt to cause spasm; 3rdly, in cases where a false passage has been formed, which these instruments, as they can be directed with greater precision, can be better made to avoid. They should be eight or nine inches long, not smaller than No. 4, slightly curved, and mounted on a firm wooden handle, and their point should be made to slide along the upper surface of the urethra, as it is at the bottom that false passages generally exist, and are most easily made. These instruments may also be used for the cure of old *impassable* strictures in the following way:—A sound of moderate size, about one-fifth or one-sixth of an inch in diameter, may be introduced once in three or four days, and be firmly pressed against the stricture for from five to fifteen minutes, taking care to keep its point against the upper part of the urethra. This will cause the anterior part of the stricture to relax a little; and if the process is repeated often enough it will at last clear the way to the bladder.* Or a sound with a conical point may be introduced into the anterior part of the stricture, and kept there for an hour or two at a time. This is often called the cure by *vital dilatation.*

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* Vide Sir B. Brodie on the Urinary Organs, 3rd ed. 1842.

2. If a *small catheter is retained in the bladder* for two or three days, the passage suppurates and dilates remarkably; just as the lachrymal duct does from the presence of a style. This method of cure is extremely speedy and efficient. It may therefore be employed, 1st, when time is of much value; 2ndly, when the stricture is very gristly and cartilaginous; 3rdly, when the urethra is irregular, or has had a false passage made in it; 4thly, when the urethra is so irritable that severe rigors and fever are occasioned by the passage of the urine after the use of the common bougie—a circumstance common enough with patients who have lived in hot climates. The catheter should be retained by means of two strings, which may either be fastened to the penis with sticking-plaster, or may be tied to the thighs, or may be passed backwards between the thighs, and be fastened to a band round the waist. It should be removed in three or four days, and a larger catheter should be passed four-and-twenty hours afterwards, and should be introduced often enough subsequently to keep up the dilatation. But the continued presence of the catheter is liable to cause so great an amount of irritation that it cannot be borne.

3. The *caustic bougie* is liable, if mismanaged, to produce inflammation, retention of urine, hæmorrhage, abscess, and any other conceivable mischief. Two kinds of caustic are used; the nitrate of silver and the potassa fusa. A touch with either is a most powerful agent in deadening the sensibility of very irritable stricture. The caustic potass is much used by Mr. Wade, who speaks highly of its effects; 1st, in hard cartilaginous strictures through which no instrument can be passed without injurious force; 2nd, in hard strictures of long standing, which, though admitting the passage of a small bougie, bleed freely on its introduction; 3rdly, irritable strictures; 4thly, spasmodic strictures when not arising from acute inflammation; 5thly, strictures which have a marked tendency to contraction, after having been dilated by the common bougie. The manner of using it is the following:—"A small piece of potassa fusa," says Mr. Wade, "should be inserted into a hole made in the point of a soft bougie. The eighth part of a grain is the smallest, and a grain the largest quantity of the potass I am in the habit of using, but it will rarely be necessary to exceed the sixth of a grain. The bougie should be well moulded round the potassa fusa, so as to prevent the alkali from projecting, and it should be so placed that it may be more applied to the upper than the lower part of the stricture. From three to four are the sizes of the bougies I generally employ, but to such as are pervious they should be used of a size or two larger than the obstruction, which the point of the instrument should penetrate. The armed bougie should be passed rapidly down to the stricture, and be held against it, with gentle but steadily continued pressure for one, two, or three minutes, according to the nature of the obstruction, for if it is very irritable and bleed

readily the caustic should be used for the shortest time on the first trial." Slight heat, and slight muco-purulent discharge, perhaps tinged with blood, are the effects which the patient is to expect; but they soon pass off, and it is to be remembered that it is an alterative and absorbefacient effect, not a mechanical destruction, which is to be wrought on the stricture. The caustic bougie may be used once in from three to five days, but never till the irritation caused by a previous employment of it, has quite subsided.*

4. *Puncturation*, or division of the stricture by means of the *lanceted stilettes* † invented by Mr. Stafford, or of Mr. Fergusson's *urethrotome*,‡ may be resorted to in some cases of old stricture, at the anterior part of the urethra.

5. The operation of OPENING THE URETHRA FROM THE PERINÆUM is absolutely requisite in all cases of rupture of the urethra with extravasation of urine, and is expedient in cases of very old stricture with extensive urinary fistulæ, when the health is giving way, and other means fail of affording relief. It is performed thus:—the patient is placed in the lithotomy position; a grooved staff is passed down to the stricture, and the left forefinger, introduced into the rectum, is to feel for the urethra, and serve as a guide to the incisions. Then a straight bistoury is to be plunged in just above the anus to the depth of an inch, and made to cut its way out upwards in the middle line of the perinæum. The end of the sound should next be felt for and cut open, and the knife is then to be carried backwards through the stricture into the urethra beyond it, which is always more or less dilated and prominent, especially if the patient is told to strain and try to pass urine. The stricture should be thoroughly divided, and all sinuses laid open. A gum catheter should then be passed into the bladder, and be retained there, so that the wound may heal over it, and form a new passage. It should, however, be changed once in three or four days.

Professor Syme has recommended a new operation, not merely for cases in which incision is commonly considered necessary, but for others in which, spite of the common treatment by dilatation, the stricture contracts again perpetually, and is wearing out the patient's health by pain, rigors, and other signs of irritation. The patient having been put under the influence of chloroform, and held in the lithotomy position at the edge of a bed, "a grooved director, slightly curved, and small enough to pass readily through the stricture, is introduced and confided to one of the assistants. The surgeon, sitting or kneeling on one knee, now makes an incision in the middle line of the perinæum or penis, wherever the stricture is seated." It should be about an inch and a half long, and extend through the skin and textures external to the urethra. The operator then taking the handle of the director in his left, and the knife, which should be a small straight bistoury, in his right hand, feels, with his forefinger guarding the blade, for the director, pushes the point into the groove behind the stricture, and runs the knife forward so as to divide the whole of the thickened texture at the contracted part of the canal. A full-sized catheter should be retained for twenty-four hours afterwards.*

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* Vide Robert Wade, on Stricture of the Urethra, 2nd ed., Lond. 1849.

† Stafford on Stricture, Lond. 1829.

‡ Lancet, 1850, vol. ii. p. 304.

In whatever manner a stricture has been cured, the bougie should still be used at intervals, to prevent a fresh contraction.

CONTRACTION OF THE ORIFICE of the urethra may be a congenital affection, or may be caused by the cicatrization of ulcers. It must be counteracted by the daily passage of a short bougie, otherwise it may produce all the evil consequences of stricture further back. If the contraction is very great, and causes retention of urine, one of Anel's probes, a common probe, and a director may be introduced in succession, and then when the bladder is emptied, the orifice must be dilated by a slight incision downwards; any subsequent contraction being obviated by the bougie.

SECTION III.—OF URINARY ABSCESS, EXTRAVASATION OF URINE, AND FISTULA IN PERINÆO.

I. URINARY ABSCESS is a frequent consequence of stricture. Either an abscess forms in the cellular tissue close to the urethra, and after a time opens into that canal; or, perhaps, one or two drops of urine escape into the cellular tissue, in consequence of a slight ulceration of the urethra behind the stricture; and this small quantity of urine produces inflammation, so that an abscess forms, filled with dark-coloured putrid pus.†

Symptoms.—A patient with old stricture complains of rather more difficulty of micturition than usual; he is seized with shivering, the skin becomes hot, the tongue brown, and the pulse faltering; and on examination, a deep, hard, and painful, but not prominent, swelling will be detected in the perinæum. Perhaps the scrotum is œdematous.

Treatment.—The abscess should be opened immediately, and the patient will soon be brought from the gates of death to comparative health. It will also be expedient to cut through the stricture as directed in the last section, and pass a catheter into the bladder.

II. RUPTURE OF THE URETHRA and EXTRAVASATION OF URINE.—This is another consequence of old stricture, and it generally happens in the following way: The patient, who has long been labouring under difficulty of micturition, has a fit of spasmodic retention more obstinate than usual. He is repeatedly getting out of bed, and straining with all his might to pass his water. At last, during one violent effort, he plainly feels that something has given way; his painful sense of distension becomes immediately less, and he is very well pleased, and thinks himself better. And perhaps he is now able to make a little water by the natural passage, because the stricture generally relaxes, when, by any means whatever, it is relieved from the former pressure. But at the time when something seemed to yield, the urethra burst; the urine was forced by the whole power of the abdominal muscles into the cellular tissue of the scrotum, perinæum, and groins; the patient soon complains of a smarting or tingling about the anus and perinæum; the urine, which has become putrid and concentrated by long confinement in the bladder, speedily causes inflammation and sloughing; the skin over the infiltrated parts displays a reddish blush, which is soon succeeded by black spots of gangrene; low typhoid symptoms appear; the tongue is black, the pulse begins to falter, the skin is clammy; low muttering delirium and hiccup come on; and the patient soon departs this life, unless proper measures are taken for his relief. A black spot on the glans penis, indicating that the urine has penetrated the corpus spongiosum, is a very fatal sign.

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* On Stricture of the Urethra and Fistula in Perinæo, by James Syme, F.R.S.E., Edin. 1849.

† In the same manner, a little urine may escape from a minute aperture in the bladder, and give rise to abscess behind the pubes, or between the bladder and rectum; which may point above the pubes; or in the groins, or may burrow amongst the muscles of the thigh.

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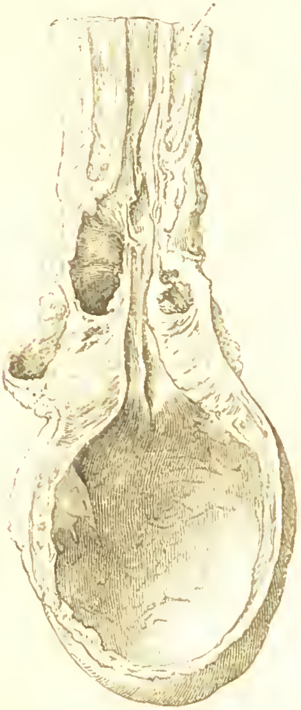

Treatment.—A staff or catheter must be passed as far as possible, and it may sometimes be passed quite into the bladder, because, as was observed above, the stricture generally relaxes after the bladder is unloaded, be it how it may. Then the urethra must be opened and the stricture be divided in the manner described in the last section, and a catheter be passed through the wound into the bladder, and be allowed to remain several days. At the same time free incisions must be made into any parts that are swelled or emphysematous, showing that they have been pervaded by the urine.

The urethra may also be ruptured by blows or kicks on the perinæum, or by accidents that fracture the bones of the pelvis. The symptoms will be pretty evident. The patient will be unable to make water; or if he attempts it, the urine will be extravasated into the perinæum and scrotum. The treatment consists in retaining a catheter in the urethra, and incising the perinæum if urine has been extravasated.

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[*] This cut exhibits the urethra laid open; a stricture at the commencement of the bulbous portion; and false passages, one of which leads into an abscess that surrounds the membranous portion.

III. Fistula in Perinæo, or *Urinary Fistula*, signifies an opening from the perinæum into the urethra, through which the urine dribbles when the patient makes water. It is a frequent consequence of urinary abscess and extravasation.

Treatment.—The first and most essential measure is, to restore the urethra to a healthy state, and to dilate any strictures that may happen to exist, by the bougie. When this has been done, the fistula should be stimulated to granulate by injections of arg. nit., or by passing a heated wire into it; and the external orifice should be occasionally touched with potass, so as not to allow it to heal before the whole track is closed—otherwise fresh abscesses will form. In extreme cases the urethra must be laid open, as before directed.

Sometimes there is a *blind* fistula in perinæo; that is, a small narrow fistula, opening into the urethra, but not externally. It is occasionally inflamed and tender; and may be felt as a small tumour in the perinæum; perhaps the size of a horse-bean. It is attended with more or less discharge from the urethra. The treatment consists in laying the tumour open, and dilating any strictures that exist.

Sometimes a fistulous communication forms between the urethra and rectum. This may be known by air passing through the urethra. It is to be treated by dilating the urethra, and then perhaps a heated wire may be introduced into the fistula from the rectum, in order to close it by the adhesive inflammation.

SECTION IV.—OF SOME OTHER AFFECTIONS OF THE MALE URETHRA.

I. Contraction of the Urethra following injuries, such as blows on the perinæum, must be treated in the same way as permanent stricture.

II. False Passage.—This may be produced by using too small a sound, and pushing it out of the urethra, or by the misuse of caustic bougies. There is nothing to be done for the false passage, but the stricture which was the origin of it must be treated either with the metallic sound, or by keeping in a small catheter. When the surgeon suspects that he has pushed an instrument out of the right passage, he ought to leave the urethra untouched for at least a week.

III. Hæmorrhage from the Urethra may be caused by the rude introduction of bougies, or by injuries from without, or by the separation of a slough formed by the caustic bougie; or, lastly, by a rupture of blood-vessels during acute chordee. If the application of cold does not check it, pressure may be tried. A flat piece of cork should be pressed by the patient against the perinæum far back, and be gradually moved forward till it lights on the right spot, and the dripping of blood ceases.

IV. Solid Tumours in the course of the urethra, composed of indurated follicles, torment the patient by keeping up a perpetual gleet and chordee. The mercurial ointment with camphor externally; and the passing of a bougie; or keeping a small catheter in the bladder for a few days at a time, are the chief remedies.

V. Acute and Chronic Inflammation of the urethra, from whatever cause arising, differ in no respect, in their symptoms, consequences, or treatment, from gonorrhœa and gleet.

VI. Foreign Bodies in the urethra may consist of calculi, or of small bodies introduced from without; of clots of blood, of mucus, or, in rare cases, of portions of fæcal matter, or worms that have passed into the bladder from the intestines by means of an ulcerated opening. They may perhaps be pushed forwards by the fingers, aided by the patient's strainings, — and then may be brought out through the orifice (which must be slightly dilated if necessary) by forceps, or a bent probe. Or, it is a very good plan to press the thumb on the urethra behind the foreign body, and then to inject a good stream of water from a large syringe, so as to dilate the passage. But if these means fail, the substance must be pushed back into the membranous portion (if not there already), and be extracted by an incision in the perinæum. Incisions into the front of the urethra should be avoided, for they are apt to leave irremediable fistulæ; or if near the scrotum, may occasion infiltration of urine into its loose cellular tissue.

SECTION V.—OF THE DISEASES OF THE PROSTATE GLAND.

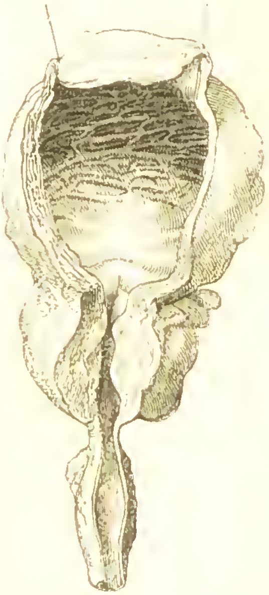
I. Acute Inflammation of the prostate is generally a consequence of acute gonorrhœa. The *Symptoms* are, great weight, pain, and throbbing at the neck of the bladder, and tenderness of the perinæum; the gland feels swelled and tender on examination by the rectum, and there are frequent, violent, and exceedingly painful efforts to make water.

Treatment.—Rest in bed, cupping or leeches to the perinæum, or general bleeding if the patient is strong, hip-baths and enemata of starch ℥ii, laudanum ʒss every night. If the urine cannot be passed without it, a very small gum catheter may be introduced; but it should be avoided if possible.

II. Abscess of the prostate may be suspected if rigors, and obscure swelling in the perinæum, follow the symptoms of acute inflammation. In any such case, the swelling should at once be freely punctured with a bistoury. If left to itself, the abscess may burst into the rectum or the urethra, which latter circumstance will be indicated by a sudden discharge of pus with the urine. If the abscess should burst into the urethra, the catheter should be used every time the patient passes his urine, in order to prevent it from entering and irritating the cyst. If the case is chronic and the habit scrofulous, quinine and tonics, and small doses of cubebs, to act as a gentle stimulus on the parts, will be of service.

III. CHRONIC ENLARGEMENT of the prostate is extremely frequent in advanced life, and seems to depend on the decay of age rather than on any disease. It generally commences, as Sir B. Brodie observes, about the time that the hair turns gray, and when earthy specks begin to be deposited in the coats of the arteries. The gland increases from two to fourteen times its natural bulk, and becomes hardened. The increase in its size is readily detected by examination with the finger by the rectum. The middle lobe generally forms a projecting tumour at the neck of the bladder, and, in consequence of the alteration of the shape and size of the gland, the prostatic portion of the urethra becomes lengthened, and curved abruptly upwards.

The first *symptoms* are slowness and difficulty in making water, sense of weight in the perinæum, and tenesmus. In the next place, the bladder becomes irritable, and the calls to make water are oftener than before. Then, as the patient cannot empty the organ completely, in consequence of the projection formed by the tumour, a portion of urine always remains behind, and decomposes, and becomes ammoniacal. Sometimes a fit of complete retention ensues, and it may be brought on by exposure to cold or excess in venery. Next, the mucous coat of the bladder, irritated by the frequent strainings, and by the alkaline urine, inflames and secretes a viscid mucus. Finally, the obstacle continuing to increase, the bladder is constantly distended, the urine perpetually dribbles away, the ureters become dilated into subsidiary receptacles; the kidneys become disorganized, the patient's little remaining strength is exhausted, and he dies. Abscess in the gland, or ulceration of that surface which projects into the bladder, sometimes adds to the patient's misery, and hastens his death.



Treatment.—Medicines are of no avail to remove senile enlargement of the prostate, although they may very likely be required for accompanying disease of the bladder or kidneys.* The only thing to be done is to introduce the catheter once or twice a day, so that the bladder may be completely emptied. The instrument will meet with an obstruction just at the entrance of the bladder, occasioned partly by irregularity of the urethra, partly by the projection of the third lobe. To avoid the latter, the instrument (commonly called *prostate catheter*) should be long, and have its point well turned up. In introducing it, the point should be made to glide as close as possible round the pubes, and the handle should be well depressed as it is entering the bladder, in order that the point may ride over the projection. The finger also should be introduced into the rectum to guide it. The best catheter, if it can be used, is a small gum, which has been kept a long while on an iron wire of considerable curve; but a silver one of proper shape is more easy of introduction.

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* Sir B. Brodie gives a case in which enlargement of the prostate in a man aged thirty-one, following gonorrhœa, was cured by the iodide of potassium; and the same remedy has been used as a local application in the senile form.

If the bladder has been long distended to the utmost, and the kidneys have become organically diseased in consequence, the sudden withdrawal of all the urine will be liable to be followed by irretrievable sinking. The urine should therefore be drawn off in small quantities at a time, and the strength be well supported with tonics, wine, and plenty of nutriment.

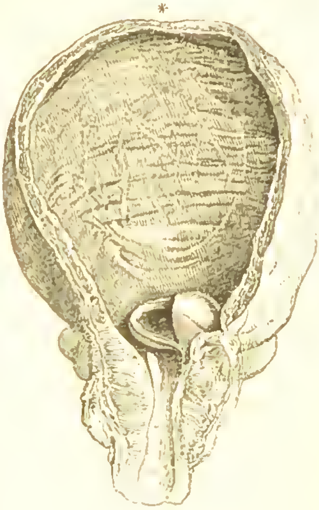
IV. COMPLETE RETENTION OF URINE from enlargement of the prostate. In this case, if there are inflammatory symptoms, cupping from the perinæum and the hip-bath are indicated. The catheter should be passed if possible, and when passed it should be retained, because the bladder does not regain its contractility for two or three days, and the frequent introduction of the instrument would be irritating. If, however, the catheter cannot be passed by the natural route, it should be thrust through the projecting part of the gland, so as to make a new passage into the bladder (or perhaps one of Stafford's *lancetted stilettes* may be advantageously employed for that purpose). But if this cannot be done, the last resource is

PUNCTURE OF THE BLADDER ABOVE THE PUBES. This is easily performed by making a small incision through the linea alba just above the pubes, and then thrusting a long trocar and canula downwards and backwards into the bladder, where it is not covered by the peritonæum. The canula must be retained, and the patient be kept on his back to prevent extravasation; and no time should be lost in restoring the natural passage.

V. CALCULI of the prostate are composed, according to Dr. G. Bird, like other calculous concretions on mucous membranes, of phosphate of lime mixed with triple phosphate, and are formed in the cells and ducts of the gland. They cause obscure irritation of the neck of the bladder, and difficulty of micturition. They may perhaps be felt by the finger in the rectum. Sometimes it may be possible to remove some of them with the urethral forceps—or if there are many contained in one cyst, to cut upon them from the perinæum; but in general the only thing to be done is, to keep the urethra well dilated with bougies, so as to favour their spontaneous escape. A remarkable prostatic stone, nearly five inches long, was removed by Dr.

Herbert Barker, of Reading, by means of an incision in the perinæum. It was composed of twenty-nine calculi closely adhering together, each no doubt having been deposited in a separate cell of the prostate, and the whole having been agglomerated into one mass by the absorption of the intervening tissue.†

VI. Scirrhus of the prostate is a disease of very rare occurrence. In one or two cases which occurred in Sir B. Brodie's practice, the gland was enlarged, and of a stony hardness; there was great pain referred to the groins and perinæum, and irritability of the bladder, and the real nature of the disease was shown by the cancerous cachexia manifest in the patient's whole appearance.



SECTION VI.—OF THE DISEASES OF THE BLADDER.

I. Acute Inflammation of the bladder (or *cystitis*) is rarely a primary idiopathic affection. Most frequently it is a consequence of neglected or ill-treated gonorrhœa, or else an aggravation of the chronic inflammation. The *symptoms* are pain, referred to the perinæum and sacrum, tenderness of the lower part of the abdomen, micturition exceedingly frequent, attended with great straining, and followed by an aggravation of the pain, a mucous or muco-purulent sediment in the urine, and fever.

Treatment.—Leeches or cupping on the lower part of the abdomen or perinæum, hip-baths and warm fomentations, castor oil, so as to keep the bowels open without much straining, and opium F. 101 at night. If, moreover, the urine is acid (turning blue litmus paper red), and if the sediment in it is yellowish and not adhesive, F. 62 may be given three or four times a day, with saline draughts containing excess of alkali in the intervals. But if the urine be alkaline (turning red litmus paper blue), and if it deposit a dark-coloured adhesive mucus, vin. colchici ♏xx—xxx should be given three or four times a day instead of the calomel and alkalis.

II. Chronic Inflammation of the bladder (*catarrhus vesicæ*) is a very frequent consequence of irritation from stricture, diseased prostate, or stone.

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* The engraving shows a cyst of the prostate gland, from the King's College Collection.

† Trans. of Prov. Med. Assoc. N. S. vol. iii.

Symptoms.—The bladder irritable, micturition very frequent and painful, the urine loaded with mucus (or rather pus, rendered viscid by the alkaline state of the urine), which is sometimes tinged with blood, sometimes yellowish and puriform, but more generally grayish, streaked with white, highly alkaline, and excessively viscid, so as to stick to the bottom of the chamber pot when turned upside down. In the early stages there is but little mucus, and the urine may remain acid; but as the disease advances, the quantity of mucus becomes enormous, and the urine is voided of a brownish hue, and of a most offensive ammoniacal odour. Moreover, it may clog the urethra, and cause retention of urine; a kind of retention difficult to manage, because the mucus clogs up the eyes of the catheter. In this stage there is very frequent desire to make water, and constant pain above the pubes. In general, the mucus contains *phosphate of lime*, which may be seen in it in white streaks, and which is apt to collect and form a stone in the bladder. Perhaps the mucous membrane of the bladder may ulcerate, and after death it may be found as cleanly dissected from the muscular coat, as if it had been done with a knife. This will be attended with an intense aggravation of the pain in micturition, and with a dark colour of the urine; owing to the admixture of a little blood which exudes from the ulcerating surface, and which, after the urine is passed, sinks to the bottom like coffee grounds. But more frequently the bladder throws out flakes of lymph, which become encrusted with patches of phosphate of lime. Moreover, the bladder, by the constant exercise of its muscles in straining, becomes hypertrophied and exceedingly thick; and portions of its mucous membrane are apt to be forced between the intervals of its muscular fibres, and form pouches which are soon filled with mucus, or with phosphatic calculi. Finally, disease of the kidneys ensues, and the patient dies.

Treatment.—In the first place, if there is a stricture, or enlarged prostate or stone in the bladder, proper measures should be taken for their removal or relief. In the next place, if the symptoms are at all severe, the patient should keep himself in the recumbent position as much as possible, with the pelvis elevated. Thirdly, if there is at any time a great aggravation of pain, and the strength is pretty good, a few ounces of blood may be taken by cupping on the sacrum or perinæum; but, as a general rule, all lowering measures are injurious. Stimulating or opiate plasters to the sacrum are sometimes of use. Pain and irritation are to be allayed by the hip-bath, and by enemata or suppositories of opium. The bowels should be kept properly open by mild aperients, such as castor oil or rhubarb; but harsh purgatives are inexpedient. The diet should consist of boiled mutton, white fish, rice, arrow-root, and other substances that are nutritious, easily digestible, and not apt to turn sour; with cold weak brandy and water, or gin and water, or sound sherry. Mercury and alkalis are of course, as a general rule, inexpedient; yet, if the urine is still acid (not being yet made alkaline by the mucus) and the strength is good, small doses may be given, if required for the state of the stomach; as will be shown when speaking of the treatment of urinary deposits, p. 526.

Besides these remedies, the bladder may be acted on by certain medicines, and by injections. Of medicines, the most useful, according to Brodie, is the root of the *pareira brava*, an ounce of which should be boiled in three pints of water down to a pint, and the decoction be administered in doses of ℥iv *ter die*—or the extract of pareira in doses of gr. xxx *ter die* may be substituted. *Uva ursi*, or *buchu*, in doses of an ounce or two of a strong infusion or decoction, F. 181; or *oil of turpentine* (♏xv.), or *chian turpentine* (gr. ii.), or *cubebs* (gr. xv.), or *copaiba* (♏xx.), or *tinct. ferri mur.* (♏xv.)—in small doses three times a day, are also remedies of similar virtues. Hyoscyamus or opium, and small doses of mineral acids, if the urine is highly alkaline, may be added to any of them. The sulphate of zinc may also be highly useful, F. 9.

Injections into the bladder are not to be thought of when there is acute inflammation of the bladder and blood mixed with the mucus, but they are highly serviceable in chronic cases, by relieving the irritability of the bladder, and washing out the organ, getting rid of the decomposed stinking urine and mucus. Injections of simple warm water are very useful; the best way of effecting them is that employed by Mr. W. Fergusson; it is, to have a catheter with a double passage, and to throw in the water in a continuous stream by means of a small syringe like that of a stomach pump. Three or four pints of water may thus be passed through the bladder daily. Decoction of poppies or laudanum may be added in some cases. Moreover, injections of very dilute nitric acid (♏i—ii—ad ℥iss aq. destil.) thrown into the bladder not oftener than once a day, through a double gold catheter, and allowed to remain thirty seconds, are of great service when the urine is highly ammoniacal.

III. Irritable Bladder.—Many cases described under this title are cases of chronic inflammation. Simple irritability, that is, a frequent disposition to pass the urine without any disease, may be caused by an irritating state of the urine; the qualities of which, and the presence or otherwise of albumen should be ascertained; or it may be the effect of mere nervousness, which is not uncommon in elderly people; or of irritation of the rectum.

IV. Paralysis of the bladder may occur under many circumstances. It may be caused by injury or disease of the head or spine; it is often present in typhus fever—it may be caused for a time by any severe injury, especially of the legs—it generally remains for a few days after the bladder has been long distended, whether from prostatic disease or stricture—and it sometimes occurs suddenly to nervous sedentary people, who, if they let their bladder get filled beyond a certain point, find that they cannot empty it. The symptoms of it are, either retention of urine; *i. e.*, that the patient cannot make water; or else incontinence of urine; that is, the water dribbles away without his being able to hold it. The diagnosis of retention through palsy, from retention through stricture, is easy. The retention from palsy comes on suddenly, and there is no obstacle to the introduction of a catheter.

A strong decoction of *parietaria officinalis ;* cantharides, ergot of rye, and tinct. ferri mur., are the remedies for simple palsy.

V. INCONTINENCE and DRIBBLING of URINE.—This is a symptom that requires particular notice ; because in nine cases out of ten it happens, not because the patient cannot hold his water, but because he has retention of urine, either from stricture or enlarged prostate, or palsy of the bladder. For it must be noticed, that, in either of these cases, as soon as the bladder becomes full, a little urine begins to dribble away through the urethra—and besides the patient may perhaps be able to squeeze out a little by straining with his abdominal muscles, and may believe his bladder to be empty, although all the while it is enormously distended. No surgeon will fail to put his hand on the pubes when he sees the urine dribbling away. The obvious remedy is the catheter.

VI. HYSTERICAL RETENTION OF URINE.—There is one form of palsy of the bladder which is not unfrequent in hysterical women, and which consists in a deficiency of volition rather than of power. They are not unable to empty the bladder if they try—but they are unable to try. These cases must be treated with purgatives, and fetid medicines, both internally and as enemata, F. 102. If the catheter is not employed, the patient will generally begin to make water as soon as she suffers much from distention; but the bladder must not be allowed to go unrelieved too long.

VII. PUERILE INCONTINENCE.—Incontinence of urine during the night is common enough in delicate children ; but the surgeon may be consulted on account of its continuing to an age at which such an infirmity becomes very troublesome and degrading. The best plan of treatment is, to administer tonics ; to rectify any disorder of digestion or irritating quality of the urine ; to prevent the patient from sleeping on his back ; to have him awakened at a certain hour, so that he may empty the bladder of his own accord ; and to adopt some means of rendering the habit so disagreeable to him, that he may be induced to correct it by exercising that degree of volition which remains during sleep. Asafœtida glysters ; nauseous medicines; and in the female cauterizing the orifice of the urethra with nitrate of silver, so that the flow of urine may cause severe smarting, are among the remedies worth adopting. Small doses of tincture of cantharides are also recommended.

VIII. FUNGUS HÆMATODES.—This form of malignant disease sometimes affects the bladder, and generally commences in the mucous membrane near its neck. The ordinary symptoms, are frequent desire to make water ; and uneasiness in the region of the bladder, aggravated after micturition, and often extending to the glans penis, perinæum, and groins. The urine is generally turbid, and deposits an adhesive mucus, and it is very frequently mixed with blood, in irregular clots; and with these, portions of medullary substance are sometimes intermingled. These symptoms, combined with the absence of a calculus, and the possibility perhaps of detecting a tumour with the sound, are the chief means of diagnosis.

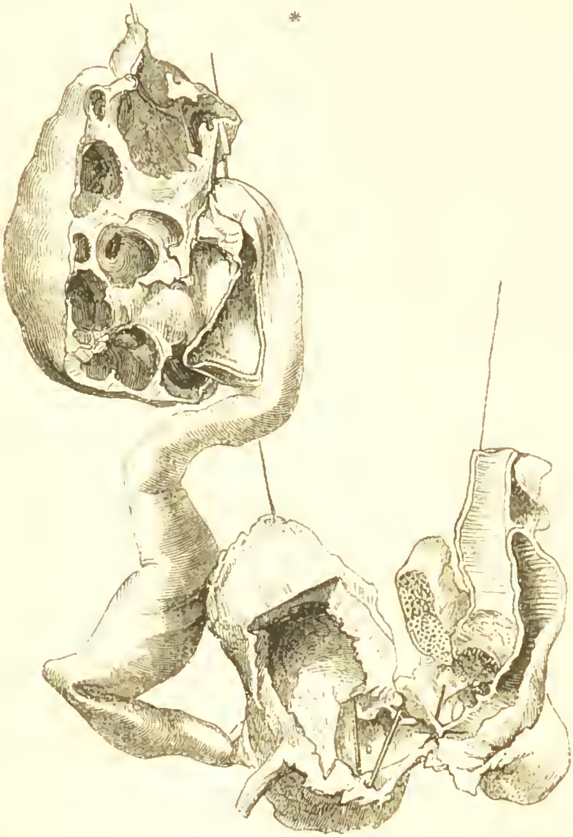
Treatment can only be palliative.

SECTION VII.—OF DISEASE OF THE KIDNEYS, HÆMATURIA, AND SUPPRESSION OF URINE.

I. ACUTE INFLAMMATION OF THE KIDNEY (*Acute Nephritis*) is sometimes caused by blows on the loins, or by the irritation of renal calculi, but is very rarely an idiopathic primary affection. The *symptoms* are, burning pain and tenderness in the loins; colicky pains in the belly; the urine scanty and high coloured, and the bladder irritable, so that there are constant attempts at micturition; fever and great thirst, and violent vomiting. The remedies are — cupping, leeches, and castor oil—repeated doses of calomel, opium, and antimony, with colchicum if the habit is gouty; warm baths, or warm fomentations to the loins, and barley water and other demulcent drinks.

II. CHRONIC DISEASE OF THE KIDNEYS, when it comes under the surgeon's care, is generally a consequence of long standing disease of the urethra or bladder. When the bladder has been subject to frequent distention through stricture or enlarged prostate, and its mucous membrane inflamed, the ureters are liable to become distended and converted as it were into subsidiary receptacles for the urine, so that all the violent strainings to evacuate it tell upon the kidneys; and these become diseased, partly from the mechanical irritation, partly from sympathy, partly from an extension of inflammation from the bladder, and partly through participating in that general degeneration of the functions and structures of the body, which is sure to ensue when any one important function is long and seriously impeded.

Symptoms.—A person, who has long been labouring under some chronic affection of the bladder, begins to complain of general weakness and languor, both bodily and mental. The sleep is unrefreshing, and the appetite impaired. There is frequent pain of a weak aching character in one or both loins; occasionally shooting down to the testicles or groins. The urine is almost invariably *albuminous;* it is generally pale-coloured and opakish when passed; sometimes it is tinged with blood, and sometimes it displays shreds or flakes of lymph, moulded probably into the shape of the ureters. As the disease proceeds, it becomes yellowish and purulent, and deposits a quantity of pus after standing, the globules of which may be detected by examination with the microscope. These cases are almost sure to end fatally. Sometimes the patient dies of exhaustion and obstinate vomiting; sometimes of suppression of urine and coma; sometimes in a sudden fit of severe shivering; and sometimes of a rapid attack of acute inflammation. The kidneys are found after death to be soft and disorganised; readily separating from their capsule, which however adheres firmly to the fat and cellular tissue of the loins; and most likely they are dilated into cysts; the secreting tissue being spread out over the dilated pelvis and infundibula.



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III. ALBUMINOUS URINE.—The presence of albumen in the urine is valuable as a sign that blood, or the serum of blood, or pus, or some other albuminous fluid, is mixed with the urine. This may happen—1st, through that degeneration of the kidneys commonly known as Bright's disease; 2ndly, through congestion of the kidneys, induced

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* This engraving, from a preparation in the Middlesex Hospital Museum, represents the beginning, middle, and end of a fatal case of disease of the urinary organs. It shows a tight stricture about three inches from the extremity of the penis; the urethra dilated behind it; another stricture in the membranous portion; false passages and abscess around; the bladder contracted in size but enormously thickened; the urethra dilated and tortuous, looking like an intestine; and the kidney expanded and atrophied, with scarce any of its secreting substance remaining.

by cold and suppression of the perspiration, or by the presence of a morbid poison, as when dropsy and albuminous urine occur after scarlatina ; or by the pressure of the gravid uterus, or of other tumours on the renal veins ; 3rdly, through an intermixture of pus with the urine.

1. Urine may be known to contain albumen, by heating a small quantity in a test-tube over a spirit-lamp, when the albumen will coagulate, and, according to its quantity, may either produce a mere opacity, or may even solidify the entire specimen heated. If the urine be alkaline, this test will fail, because then heat alone will not coagulate the albumen ; and, moreover, heat alone may cause a deposit of white phosphates ; therefore a drop of nitric acid should be added, which will prevent mistake. Search should be made with the microscope for the little shreddy particles of albumen, which indicate disease of the tubuli uriniferi of the kidney. They generally fall to the bottom of the vessel, and form a dirty white cloud-like mucus.

2. When urine contains a very small quantity of blood, which has drained from the tubuli uriniferi, it has a dingy, smoky hue, like port wine and water ; the albumen coagulates by heat ; and blood-corpuscles and minute fibrinous shreds may be discovered by means of the microscope.

3. Pus may be present in the urine, through suppuration of any part of the mucous lining of the urinary passages, or from an abscess in some contiguous part which has burst into them. It generally falls to the bottom of the vessel containing the urine, "forming a dense homogeneous layer of a pale greenish cream colour, seldom hanging in ropes in the fluid, like mucus, and becoming, by agitation, completely diffused through it. The addition of acetic acid neither prevents this diffusion, nor dissolves the deposit. If a portion of the deposited pus be agitated with an equal quantity of liquor potassæ, it forms a dense, translucent, gelatinous mass. On decanting some urine from the deposited pus, the presence of albumen may be detected by heat and nitric acid."* The pus globules may be recognised under the microscope.

4. Mucus, when present in urine, may be distinguished from pus, by the addition of acetic acid, which corrugates the viscid liquor of the mucus, but exerts no such action on the *liquor puris*. Moreover, mucus contains no albumen in a state capable of coagulation by heat or nitric acid.

Abscess in the Kidney.—This may be suspected if dull pain in the loins and repeated shivering follow the symptoms of nephritis. Sometimes the abscess bursts into the ureter, and an immense quantity of pus is discharged with the urine. Abscess of the kidney also sometimes bursts on the loins, and the patient has been known to recover.

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* Quoted from Golding Bird on Urinary Deposits, 2nd edit. p. 273 ; a work containing most ample and valuable information on the subject it treats of. See also the *Art.* Ren. by Dr. George Johnson, in Todd's Cyclopædia, for a full account of morbid conditions of the kidney.

IV. TREATMENT OF CHRONIC KIDNEY DISEASE.—On this subject we can but give a few general hints. When there is much tenderness in the loins, a moderate quantity of blood may be taken by cupping. Blisters or issues, or plasters of the emp. ammoniaci c. hydrarg., or of belladonna, may also be of service. The skin should be excited by warm baths and friction; and flannel should be constantly worn. It will be necessary to provide for the free action of the liver and bowels, and to keep up the secretion of the kidneys, if deficient, by the milder sorts of diuretics; such as small doses of neutral salts; the infusions of buchu, and uva ursi, of carrot-seed, or of the root of parsley. The tartrate or citrate of iron will be of great service. The diet generally should be plain and nutritious, and all acescent and indigestible substances should be carefully avoided.

V. HÆMATURIA, or *Bloody Urine.*—The seat of the hæmorrhage may be either the kidneys, or the prostate or bladder. 1. Hæmorrhage from the *kidney* is generally caused by the irritation of renal calculi, or by blows on the loins; but it may also depend on a diseased state of the whole system, as in typhus fever or scurvy. The blood is rarely in large quantity, and it is equally diffused through the urine; although perhaps there may be some long shreds of coagulum formed in the ureter. If the urine is boiled, the blood will coagulate, and leave the fluid of its natural colour.

2. Hæmorrhage from the *prostate* or bladder may be caused by the rude introduction of instruments, or by the irritation of stone; or by the existence of an ulcer or fungoid tumour, of which in fact it is often the earliest manifestation. When the blood is derived from the bladder, some portion of it often flows pure after the urine is discharged, and it is in much greater quantity, and often in larger and more irregular clots than when derived from the kidneys; moreover, the pain in the back, and other signs of renal irritation that accompany bleeding from the kidney, will not be present.

Treatment.—When hæmorrhage from the kidneys is attended with inflammatory symptoms, bleeding and the acetate of lead are indicated; when with symptoms of debility, the dilute sulphuric acid, alum, tinct. ferri muriatis, or gallic acid, in doses of gr. v. in a draught with mucilage and a little henbane; and when with symptoms of gout, alkalis and colchicum are indicated. Cold may be applied to the loins and hips by means of bladders of ice. In hæmorrhage from the bladder a catheter should be passed and be retained, in order to prevent both accumulation of blood in the bladder, and straining efforts at micturition. If the hæmorrhage is obstinate, the bladder may be injected with cold water containing a scruple of alum to each pint; and if much blood have coagulated in the bladder, it will be necessary to break it down by repeated injections of water.

VI. SUPPRESSION OF URINE, *ischuria renalis.*—When the kidneys have been long abused by inordinate indulgence in strong drink, and are falling into disease,—or when they have become diseased through fatty degeneration, or through the irritation of stricture or enlarged prostate, they are liable suddenly to lose their function of secreting the urine. The consequence of this is, that the urea and other elements of the urine accumulate in the blood; the patient complains of great uneasiness in the head and loins; he becomes first drowsy, and then comatose, and dies in four or five days of effusion into the brain. This affection is alluded to here, in order to hint at the diagnosis between it and retention of urine. In suppression, if the catheter is introduced, the bladder will be found empty; whereas in retention, whether from stricture, or from diseased prostate, or from palsy of the bladder, it may be felt full and distended above the pubes.*

SECTION VIII.—OF DISEASED CONDITIONS OF THE URINE, AND URINARY DEPOSITS OR GRAVEL.

In the urine are washed away the refuse matters derived from digestion, assimilation, and the wear and tear of the body. Any deviation, therefore, from a healthy state of digestion and nutrition is sure to be followed by a change in the properties of the urine. So extensive and complicated is the chemical and physiological history of these changes, that we can but refer to the works of Prout, Liebig, Golding Bird, Bence Jones, and Garrod, with which every well-informed practitioner is acquainted, and must confine ourselves to the immediate bearings of the subject on surgical practice.

We may observe that when the surgeon examines the urine, since it varies extremely in its properties at various hours of the day, the whole quantity that is passed during twenty-four hours should be collected into one vessel; so that its acidity, and specific gravity and quantity may be fairly estimated.

We may observe as a further preliminary, that when a precipitate is let fall from the urine after it has been voided, it is called a *sediment*; that when precipitated in the bladder or kidneys it is called *gravel*; and that gravel lodging in any part of the urinary passages may concrete into *stone*. Further, that when the urine of any person habitually presents any one kind of deposit, he is generally said to have a corresponding *diathesis*; as the lithic diathesis, &c.

The principal diseased conditions we are at present concerned with are those in which the urine deposits—1st, uric or lithic acid; 2ndly, oxalate of lime; 3rdly, phosphates.

I. LITHIC, OR URIC ACID, OR RED GRAVEL.—This is deposited in the form of minute crystals, tinged with the colouring matter of the urine, and resembling cayenne pepper. It indicates a highly acid state of the urine, through which it is precipitated from the ammonia with which it is generally combined.

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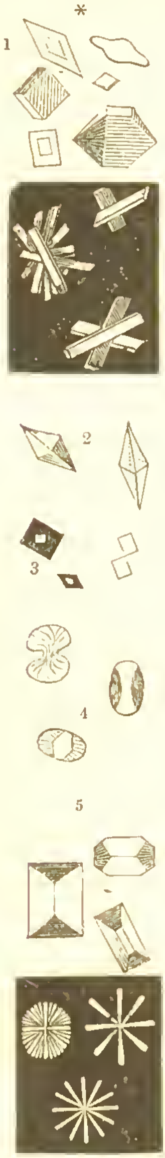
* For information on the subject of this and the following sections, consult Prout on Stomach and Urinary Disease; Dr. Garrod's Lectures in Lancet, 1849, and Dr. Bence Jones's Lectures in the Lancet for 1850, vol. i.; Sir B. Brodie's Lectures on Diseases of the Urinary Organs, 3rd edition; Golding Bird, op. cit.



When the crystals of this acid are examined under the microscope, they present various appearances, most of which, however, are modifications of the rhombic prism, as shown in the adjoining cut.

The *lithate of ammonia* is a very common floculent sediment, varying in colour from nearly white to dark red or yellow. The urine from which it is deposited is generally acid; clear when passed, but clouded as it cools; and this sediment may readily be distinguished by its dissolving when heated slightly.

Lithate of ammonia, deeply tinged by pink or brick-dust colouring matter, forms the sediments observed in fever, gout, and chronic diseases of the liver.

II. Oxalate of Lime is generally deposited from urine which is clear when passed, highly acid, and varying much in quantity and specific gravity. It is in the form of excessively minute crystals, invisible except by the microscope. But its presence may be inferred with tolerable certainty, if the urine is excessively acid and irritating, though pale; and if, on standing for some hours in a tall vessel, it lets fall a very fine white sediment; in which under the microscope the crystals may be found.

III. Phosphatic Deposits always indicate an alkalescent state of the urine, through which the phosphates of lime and of magnesia are precipitated; but they do not of themselves, as has been most happily shown by Bence Jones, prove that phosphoric acid is in excess in the urine. The most common cause of alkalescence in the urine, is carbonate of ammonia, derived from urea, which is quickly decomposed under certain circumstances, and especially from the presence of mucus, or of a diseased state of the mucous membrane of the bladder. The urine may likewise be alkaline, from relative excess of potass or soda, especially at times when the stomach is busily employed in the work of digestion, and is full of acid. The varieties of phosphatic deposit, are—1. the *triple phosphate* of ammonia and magnesia, which appears in sparkling prismatic crystals on the surface of the urine; and 2nd, the phosphate of lime, a white amorphous powder, generally associated with mucus. Often these substances form a thin greasy-looking iridescent film on the surface of the urine.

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* 1. Crystals of uric acid; 2. Crystals of oxalate of lime; 3. The same dried; 4. Dumb bell crystals of the same; 5. Triple phosphate. After Golding Bird.

Pathological Relations.—The red gravel often accompanies a gouty tendency, and may exist in conjunction with a highly sthenic plethoric condition: the oxalic, and phosphatic, on the other hand, generally indicate feeble powers of assimilation, and exhaustion of the nervous system. Any deposit may exist occasionally in small quantity, unnoticed; it is their constant or abundant presence which constitutes disease.

When a patient is secreting the red gravel, or has, to use the vulgar phrase, a *fit of the gravel*, he usually complains of great pain in the loins and bladder; frequent desire to make water; and aching of the testicles and hips. Sometimes these symptoms are attended with great feverishness; sometimes with mere languor and dyspepsia.

When oxalate of lime is abundant, the whole urinary organs are apt to suffer extremely; with frequent micturition; aching in the loins and bladder; great irritation of the genital organs; often these symptoms are combined with peculiar lassitude, fits of headache, sour perspiration, nettle-rash, extreme despondency, and other signs of obstinate indigestion and of a disordered condition of the blood.

When the phosphates are deposited, and the urine alkalescent, there is usually either a low form of dyspepsia, or some disease of the mucous membrane of the bladder, or both.

Treatment.—The treatment of urinary disorders has of late years been made too dependent on an imperfect chemical examination of the urine; it being the custom to give acids if the urine is alkaline, and so forth, without sufficient regard to other circumstances. The author stated in an edition of this work published in 1841, that this summary method of treatment was essentially erroneous, and that he had often observed the urine ammoniacal and covered with crystals of triple phosphate, when the stomach was full of acid. Subsequent experience has confirmed his ideas on this point; and he would advise his readers, when consulted in such cases, to treat the general health, and leave the urine to take care of itself.

The first thing to notice, is the patient's blood-making powers, and his habits. Because if lusty, and red-lipped, and a high liver, and troubled with lithic gravel of no long duration, he will generally be speedily relieved by full purgation; by low diet, warm baths, and liq. potassæ in drachm doses thrice daily after meals. The diathesis will be kept at bay likewise by habits of early rising, by exercise enough to make the skin eliminate acid; by great temperance in meat and beer or wine; by freely eating fresh vegetables, and especially cabbage, water-cresses, and fruit, provided always that they cause no inconvenience to the stomach; and by occasional effervescing, saline, or alkaline draughts—such as lemonade, potass water, seltzer water; or F. 58, 60, 61, 70, 72, 73, &c.

But far different must be the treatment if the urinary deposit, be it what it may, is created, not by an excess of material in the system, but by feebleness of the powers which ought to convert the food into healthy flesh and blood. In these cases the prime object must be, to strengthen the digestion ; and the means are the following—1. It is often beneficial to begin the cure by freeing the liver and bowels of black offensive scybalous motions, by a grain or two of calomel, with colocynth, or with some tonic purge, to carry it off, F. 37, 41, 50, &c. The motions should be inspected; and the medicine be repeated at discretion till they are rendered healthy. 2. There are few remedies comparable to *change of air*, including as it must, change of diet, water, habits, and occupation, for the cure of all disorders of malassimilation. 3. *Alkalis*, such as F. 77, 79, may often be given in small doses after meals to the infinite comfort of the stomach, if the patient complains of sour eructations, flushed face, flatulence, &c. 4. But the most important medicines are *Tonics*. Of these one of the most useful is the nitromuriatic acid, F. 22, which may always be given with benefit on *an empty stomach*, if the patient likes it ; if he feels that it takes away that nauseous flabby alkaline condition of mouth which so commonly accompanies a low digestive power. But the other mineral acids: bark, quinine, strychnine, and other bitters; the sulphates of zinc and of iron; and the muriated tincture of iron will all be found useful. 5. *Opium* introduced into the rectum as a suppository is often necessary to allay local irritation. 6. The *diet* should consist of those substances which are most readily convertible into good flesh and blood, and least liable to undergo degeneration during their solution in the stomach. Meat, beef-tea, milk, eggs, good bread, cruciferous vegetables ; brandy and water, or sound sherry, or bitter ale, show the kind of substances to be preferred; and sugar, pastry, sago, slops, and bad wine the things to be avoided.

SECT. IX.—OF THE VARIOUS KINDS OF CALCULI.

The various deposits spoken of in the preceding section may, as we observed, lodge in some part of the urinary organs, and concrete into stone. There are altogether fourteen species, many of which are excessively rare. The principal ones are, the lithic, phosphatic, and mulberry.

I. Lithic Acid calculi are generally oval, flattened, fawn, or mahogany-coloured, and on a section are seen to be composed of concentric laminæ. *Tests.*—This acid may be dissolved by boiling in *liquor potassæ;* it burns away almost entirely before the blowpipe, and if digested in a small quantity of nitric acid, and evaporated at a very gentle heat, it leaves a scarlet residue, which becomes purple on the addition of ammonia.

II. Lithate of Ammonia rarely forms a calculus, because it is tolerably soluble in warm urine. *Tests.*—It may be known by the same tests as the preceding, and besides it evolves ammonia when treated by liq. potassæ.

III. Phosphate of Lime or *bone earth* calculi are rare. They are pale brown, friable, and laminated. *Tests.*—Soluble in nitric or muriatic acids, and precipitated by liq. ammoniæ; infusible except at a very intense heat.

IV. Triple Phosphate (*of ammonia and magnesia*) forms white or pale gray calculi, composed of small brilliant crystals. *Tests.*—Soluble in acetic or muriatic acid; evolves ammonia when treated with liq. potassæ.

V. The Fusible Calculus is formed of the phosphate of lime and triple phosphate mixed. It forms a white friable mass like mortar, and is very fusible.

VI. The Mulberry Calculus is composed of oxalate of lime. It is dark red, rough, and tuberculated. *Tests.*—Soluble in nitric acid, and if exposed to the blowpipe, the acid is burned off, and quick lime is left, which, if moistened, reddens turmeric paper.

VII. Besides the above, calculi are sometimes composed of *carbonate of lime*, *cystic oxide* (a peculiar animal substance, soluble both in alkalis and dilute mineral acids, and containing much sulphur), *fibrine* of the blood, and *xanthic* or *uric oxyde*, a peculiar animal matter allied to uric acid. The lithate of soda, the lithate and carbonate of magnesia, and silica are also rare ingredients in calculi.

Alternating Calculi. Sometimes stones are composed of alternate layers of lithic acid and oxalate of lime; and very commonly the outer layers of a stone are phosphatic, the nucleus lithic or mulberry. The phosphates commonly succeed the other deposits, being surely produced after a time by the irritation of the mucous membrane; but the lithic and mulberry never coat the phosphates.

SECTION X.—OF STONE IN THE KIDNEY AND URETER.

Symptoms.—The symptoms of stone in the kidney are, pain in one or both loins; irritation and retraction of the testicles; the urine bloody after violent jolting exercise; and occasional fits of inflammation of the kidney. Stones in the kidney are most frequently composed of lithic acid, which will be known by the deposit of red sand from the urine. The mulberry calculus is more rare; it may be suspected if the urine is free from sediment, either lithic or phosphatic, and if dark-coloured blood is frequently mixed with it. Crystals both of this substance and of lithic acid have been detected in the tubuli uriniferi. Phosphatic stone in the kidney is still more rare. When it does exist, it is generally composed of the phosphate of lime, and indicates incipient disease of the organ.

Treatment.—When a stone is ascertained or suspected to exist in the kidney, the indications are, *first*, to examine the general health, and treat any derangement according to the rules laid down in the previous sections; *secondly*, to endeavour to expedite the passage of the stone through the ureter, by diluents and diuretics; and by the *cautious* use of exercise so as to dislodge it; and, *thirdly*, to remove inflammation and pain by cupping on the loins (if the habit is inflammatory), by mild aperients and copious enemata of warm water, by opium or henbane, and by warm baths or fomentations. Pounded ice applied to the loins gives great relief when much burning pain is complained of; but it must be used with caution.

The ordinary and most favourable event of renal calculus is, that it descends through the ureter into the bladder. In some cases, however, it remains in the kidney, increases in size, completely fills up the pelvis and infundibula, and causes the organ either to waste away or to suppurate; the abscess bursting either into the colon, or on the loins.

The PASSAGE OF A STONE THROUGH THE URETER causes the following symptoms:—The patient complains of sudden and most severe pain, first in the loins and groin, subsequently in the testicle and inside of the thigh. The testicle is also retracted spasmodically. At the same time, there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder.

Treatment.—The warm bath, large doses of opium, emollient enemata, and plenty of diluents, are the obvious remedies, and an active purgative may perhaps be tried if the process is slow.

Sir B. Brodie has shown that there is a set of symptoms which frequently affect gouty people—consisting of pain in the loins reaching to the groin and neck of the bladder; and scanty, high-coloured urine—which very much resemble those caused by the passing of a stone through the ureter. They may be distinguished by the absence of faintness and vomiting, and readily yield to purgatives and colchicum.

SECTION XI.—OF STONE IN THE BLADDER.

STONE IN THE BLADDER produces the following *symptoms:* 1. Irritability of the bladder, frequent irresistible desire to make water. 2. Occasional sudden stoppage of the stream of water during micturition, from the stone falling on the orifice of the urethra; the stream probably flowing again if the patient throws himself on his hands and knees. 3. Occasional pain at the neck of the bladder, always severest after micturition. 4. Pain in the glans penis. If the patient be a child, he is always attempting to alleviate this pain by pulling at the frænum, which becomes extremely elongated. 5. *Sounding.* But none of the above symptoms must be depended on alone. The existence of the stone must be made sensible to the ear and fingers by means of a sound, a solid iron rod like a catheter, but not so curved, and with a polished handle. This should be introduced, the patient lying on his back, the pelvis raised on a pillow, and the bladder nearly, but not quite, full. In order to ensure perfect quietness, and to prevent pain to the patient, he should be put under the influence of chloroform. The sound should be carefully moved about, to examine every part of the bladder, and if there is a stone of any size it will most probably be heard to strike and felt to grate upon it. If nothing, however, is discovered, the patient may be made to turn on one side, or to sit upright, or the finger may be passed into the rectum ; or a catheter may be introduced, and the stone may perhaps be felt to strike against it as the urine flows away. But if the symptoms are well marked, the surgeon must not be contented with one unsuccessful examination. On the other hand, the rubbing of the sound on the bladder, or on gravel entangled in mucus, must not be too hastily set down as signs of stone.

The symptoms of stone vary in their severity :—1. according to its size and roughness ; 2. according to the state of the urine ; 3. according to the condition of the bladder, whether healthy or inflamed. They may be very slight for years ; in fact, a little pain in micturition and bloody urine after riding may be the only inconveniences. But after a certain period the bladder suffers just as it does from any other cause of irritation ; the urine deposits a slight cloud of mucus ; the bladder becomes more and more irritable and finally inflamed ; the urine becomes alkaline, and loaded with viscid mucus, and of course with the triple phosphate and phosphate of lime ; the strength fails, and finally, after years of suffering, the patient sinks under the irritation. Sir B. Brodie, however, has observed, that if the prostate become enlarged, the sufferings from stone are often mitigated ; because it is prevented from falling on the neck of the bladder.

The sources of vesical calculi are two :—1. From the urine ; 2. from the mucus of the bladder; and calculi are exceedingly liable to form from the latter source, if the prostate is diseased, or if foreign bodies are introduced into the bladder, so as to serve for nuclei. In these cases, the stone is invariably phosphatic. And all calculi, whatever their original composition, are sure to become coated with the phosphates if they remain till the patient becomes old and the bladder diseased.

The *composition* of a calculus will be determined by the state of the urine. Its *size* may be appreciated :—1, by its composition, for the phosphatic are always the largest: 2. by the time it has existed ; 3. by observing the force required to dislodge it from its situation ; 4. it may be measured by passing the sound across its surface, or by the urethra forceps. Calculi have been known to vary in weight from a few grains to forty-four ounces, and in number from one to one hundred and forty-two. The largest that was ever extracted entire weighed sixteen ounces, but the patient died ; Sir A. Cooper was the operator. Gooch tells us that Mr. Harmer, of Norwich, in the year 1746, extracted one entire which weighed nearly fifteen ounces, and the patient lived five years. And Mr. C. Mayo, of Winchester, extracted one weighing fourteen ounces and a half, but it was broken, and the patient lived several years.

Treatment.—The indications are :—1. to get rid of the diseased state of the urine; 2. to allay pain and irritation; 3. to remove the stone. The first and second are to be accomplished by measures which have been already spoken of when treating of gravel and of chronic inflammation of the bladder. The third may be executed in four ways, viz., 1, by extraction of the stone through the urethra; 2, solution of it by injections; 3, lithotrity, and 4, lithotomy.

1. *Extraction by the Urethra.*—When a stone is known to have recently escaped from the ureter into the bladder, the first point is to remove all irritability of the bladder by sedatives, and by restoring the proper condition of the urine, so that there may be no spasm to obstruct its passage into the urethra. The patient also should drink plentifully, so that the bladder may be quite filled. Then, when he is going to make water, he should be instructed to lie on his face, and to grasp the penis so that the urethra may become distended with urine; and thus, very probably, the sudden gush that will come, when he relinquishes his grasp of the penis, will bring the stone with it. In some cases the urethra may be dilated by passing bougies. But should this plan not succeed after some days, Weiss's urethral forceps should be tried. The patient being placed on his back with his pelvis raised, a catheter is to be introduced to draw off the urine, and five or six ounces of tepid water are to be injected afterwards. Next the forceps, being introduced, is to be made to feel for the stone, and the blades are to be cautiously opened over it and made to seize it. An index on the handle of the forceps will now show the size of the stone. If small, it may be extracted at once; if very large, it must be left where it is; if of a doubtful size, it may perhaps be brought into the membranous portion of the urethra, whence it can be extracted by incision.

2. *Solution by injections.*—Sir B. Brodie has satisfactorily shown that *phosphatic* calculi may sometimes be dissolved altogether, and sometimes be so disintegrated or reduced in size that they may escape through the urethra by means of injections of very dilute nitric acid passed through a double gold catheter in the manner directed for chronic cystitis. At the same time, these injections diminish the secretion of mucus, which is the source of the phosphate of lime. *Oxalic* calculi appear to resist the action of all solvents. The disintegration of *lithic* calculi by solutions of alkalis, or of borax, or by Vichy water, has been the subject of numerous experiments; but the results cannot yet be spoken of as more than encouraging to perseverance.*

SECTION XII.—OF LITHOTRITY.

It need scarcely be said, that the object of this operation is to reduce stones in the bladder into fragments of so small a size, that they may be readily expelled through the urethra.

The apparatus by which this object was first accomplished by

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* Vide the case of D. B. Jacob, at p. 29 of Dr. Willis's work on Stone.

Civiale and Leroy was, as Sir C. Bell rightly called it, villanous and dangerous enough. A straight cylindrical canula was introduced into the bladder, containing three or four branches which could be protruded from its extremity. These were made to grasp the stone and hold it tightly, whilst it was bored, and scooped, and excavated by drills and other contrivances contained in the centre of the canula, and worked by a bow. When the stone was sufficiently excavated, its shell was crushed by a most complex piece of mechanism called the *brise coque*, or shell-breaker. " For some time," says Mr. Liston, " it was maintained, that almost every case of stone could be satisfactorily disposed of by this boring and grinding process. It was tried extensively," but, " after many miserable and painful failures, utterly disappointed the hopes of its advocates." Nor will these failures be wondered at, when we consider the difficulty sometimes of seizing the stone, sometimes of disentangling the instrument from it*—the extremely slow and inefficient means of disintegrating it, and the great number of times the operation was consequently obliged to be repeated; not to mention the pain caused by the stretching of the urethra with a large straight instrument—the risk of entangling the coats of the bladder, and of seriously bruising the parts about the neck—and the most incomprehensible perplexity of the instruments employed—the nomenclature, structure, and use of which require not a little study.

The next method which was employed, and which was first practised by Heurteloup,† consisted in hammering the stone to pieces. The patient was confined to a bed of peculiar construction, called the *lit rectangulaire*; and the *percuteur courbe à marteau*—an instrument composed, like that represented in the next figure, of two blades sliding on each other, was made to seize the stone. It was then broken by repeated blows with a hammer on the other extremity of the instrument, which was fixed securely to a vice. But this plan was fraught with many inconveniences. The instrument was liable to be bent or broken; its blades were apt to become so clogged with pulverised fragments, that they were withdrawn with difficulty, or perhaps not until the orifice of the urethra had been slit up; and the bladder was exposed to injury from percussion communicated from the instrument, and from the violent splitting of the calculus.

The instrument which has now superseded the foregoing, is the *screw lithotrite* of Mr. Weiss; which is composed of two sliding blades, between which the stone is seized, and then is crushed by gradual pressure with a screw. This instrument was, in fact, originally invented in 1824 (although it was laid aside at the recommendation of Sir B. Brodie, who thought it liable to some objections, and was superseded for a time by the straight drills of Civiale and the *percuteur* of

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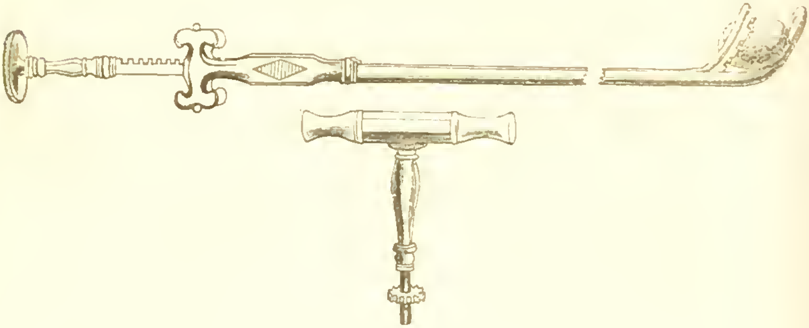
* In fact, in one case, the branches could not be returned into the canula; and the instrument was obliged to be dragged out open through the neck of the bladder and urethra.

† In the year 1830.

Heurteloup); and it was from this that Heurteloup took the idea of the *percuteur*; *disimproving* it, however, by substituting the hammer for the screw. Mr. Fergusson prefers a kind of hand-rack and pinion, as a more convenient mechanical power than the screw. In order to prevent any clogging of the blades by the lodgment of fragments, the anterior blade is made open to receive the other within it. The operation is performed as follows. The patient is placed on a couch with his pelvis well raised, and his shoulders comfortably supported; the bladder is then emptied, and five or six ounces of tepid water injected with a proper catheter and syringe. The instrument, previously warmed and oiled, is slowly introduced and placed upon the stone—its blades are opened and made to grasp it between them—the handle is moved from side to side, to ascertain that no part of the bladder is entangled—and then it is depressed so as to lift the stone towards the neck of the bladder. The screw or handle is then slowly and cautiously turned backwards and forwards till the stone is crushed by its repeated impulses. Then the instrument should be withdrawn. After some days, when the irritation has subsided, the fragments must be seized and comminuted with the same instrument, or with a smaller one, or with one that has not the aperture in the anterior blade. Sometimes they may be removed with sundry scoops. But whether this can be done at one sitting or at many, must depend on the size of the stone, and the degree of inconvenience suffered by the patient.



The experience of the last few years has added much to the favourable opinion entertained by surgeons as to the effects of lithotrity, and its capability of being substituted for lithotomy. Yet, in order to avoid the most painful and disastrous results, the greatest care must be taken in selecting the cases which are submitted to this operation.

Lithotrity is applicable, 1, when the stone is small, or of moderate size, say from an inch to one inch and a half in diameter. As a general rule the operation is not suitable when the stone is greater, although it is true that larger stones have often been successfully crushed. 2ndly. When, with a small or moderate sized calculus, there is no disease of the kidneys or bladder, and no undue irritability of the urinary passages. This is a point of the utmost importance, for, should it unfortunately happen that there is much sensibility of the bladder or urethra, an intense amount of irritation may be excited by the operation, and the most severe and fatal results may follow; and it must be acknowledged that when a fatal result does take place in consequence of the operation of lithotrity, it is preceded by a much greater amount of suffering than if the same event were to happen after lithotomy.

If there be a stricture of the urethra at the same time, it will be necessary to dilate the canal fully beforehand, or if this cannot be done, it would be better to employ lithotomy, as the play of the instrument is hindered by any contraction; in most instances, however, it will be possible to dilate the urethra sufficiently to permit the free use of the lithotrite.

An enlarged and diseased prostate is a condition of things which enhances the difficulties of lithotrity, and, in some instances, must prevent its performance altogether—if, for instance, the gland bleeds much when an instrument is passed, and much pain is produced; moreover, it is always a serious complication if the middle lobe is enlarged, because, even if the stone be well crushed, the fragments will be prevented from coming freely away. Sometimes in such cases the patient has not the power of passing his urine; here the fragments should be brought away in the blade of the lithotrite after the calculus has been crushed.

The bad results which may happen after lithotrity are several. Irritative fever of the worst description may set in, accompanied with intense local irritability. There will be a constant desire to pass water, and a great difficulty in doing so, and the act will be accompanied with dreadful sensations of pain; and if these symptoms are not subdued, death will follow. And on examination it will be found that inflammation of the bladder, and ureters, and probably of the kidneys has been produced. In such a case the treatment should be obviously to soothe the parts as much as possible. The patient should be kept perfectly quiet—the warm bath, and especially opiate enemata or suppositories should be employed, and plenty of demulcent fluids should be given to drink; if these fail to give relief, and the symptoms still continue, the best thing is to cut into the bladder at once, and remove the fragments which are producing the irritation.

A troublesome thing sometimes happens after lithotrity, if a fragment gets lodged in the urethra, and produces retention of urine, and much suffering. It should be either pushed back by a catheter; or, if this cannot be done, the urethra forceps must be introduced. If this fails, and retention continues, it will be necessary to cut into the urethra and extract the portion of calculus.

Rigors sometimes take place after the operation, and are very distressing and weakening; it will be well to guard against their recurrence—the best way of doing which is to cover the patient well up in warm blankets, to give him a full opiate, or a glass of hot brandy and water.

Above all things, in order to ensure safety, it is necessary to keep the patient in perfect quietness during the time he is under treatment; he should not be allowed to walk out, if the smallest fragment of stone be still in his bladder.

SECTION XIII.—OF LITHOTOMY.

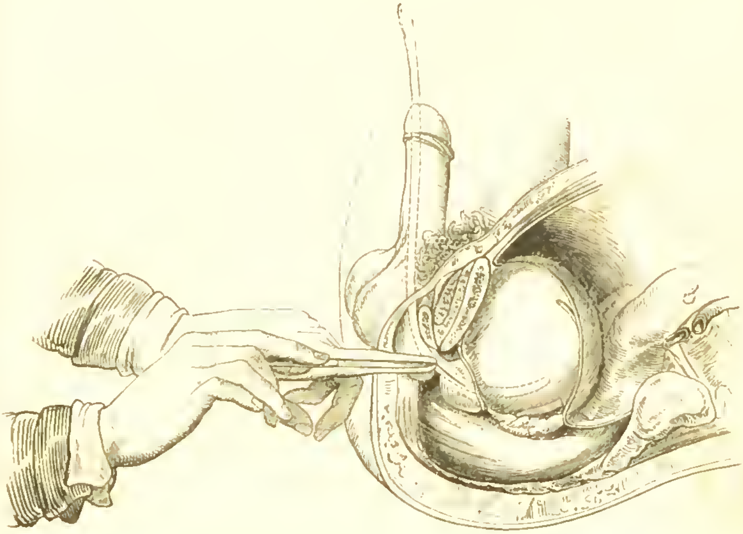
Contra-indications.—The surgeon must, in the first place, ascertain that the patient is free from serious organic disease—which would render him liable to sink under the operation. Languor, depression, loss of strength and flesh and appetite, irregular shiverings, pain and tenderness in the loins, purulent or highly albuminous or bloody urine, indicating organic disease of the kidneys; excessively frequent and painful micturition, with the urine constantly bloody and purulent, indicating serious organic disease or ulceration of the prostate or bladder—the existence of hectic or pulmonary consumption, or of any other extensive disease, require the surgeon to decline the operation—or at least to perform it only at the urgent and repeated request of the patient, who should be informed of its probable result.

Preparatory Treatment.—In the second place, the patient must be well prepared by measures calculated to improve the general health, and to remove all disorder of the urine and irritability or congestion of the bladder. He should not even be sounded whilst labouring under any local or general vascular excitement.

There are four methods in which lithotomy may be performed, viz. the lateral operation in the perinæum—the bilateral—the recto-vesical—and the high operation. The lateral is that which common consent has decided to be the best, except in a few rare instances. There are an infinity of minute variations in the manner of performing it, and in the instruments employed by different surgeons. In the following description the author avails himself principally of the directions given by Sir B. Brodie, Mr. Liston, and Mr. Fergusson.

LATERAL OPERATION.—It is advisable that the bowels should be cleared on the morning of the operation with a simple enema. The bladder should be moderately full, and if the patient has recently emptied it, a few ounces of water may be injected. The patient should be under the influence of chloroform. It is desirable that the existence of the stone should be clearly demonstrated with the sound or staff, immediately before the operation. Then the proceedings may commence by introducing the *staff*—a solid steel rod like a sound, with a deep groove either on its convex border, or, as some surgeons prefer it, a little on its left side. It should be as large as can be conveniently introduced.

The next point is to place the patient in a convenient posture. He should be placed on his back, on a table two feet and a half high, with his shoulders resting in the lap of an assistant, who sits astride behind him. Then, in order to expose the perinæum thoroughly, he must be made to raise and separate his thighs; and to grasp the outside of each foot with the hand of the same side; and the hand and foot are to be firmly bound together by a broad garter; meanwhile, if not done before, the perinæum should be shaved. The surgeon may, says Mr. Fergusson, pass his left fore-finger well oiled into the rectum, to ascertain the size of the prostate, and its depth from the surface; he should also explore with his fingers the surface of the perinæum, and the position of the rami and tuberosities of the ischia.



Everything being now prepared,—an assistant on each side holding the thighs firmly asunder—another being at hand to give the surgeon his instruments—and a third stationed on the left side holding the staff perpendicularly, and well hooked against the symphysis pubis—in which position he is to hold it steadily from first to last; the surgeon commences by passing in his knife to the depth of an inch on the left side of the raphé, about an inch before the anus, and cuts downwards and outwards to the bottom of the perinæum, midway between the anus and tuberosity of the ischium. "The fore-finger of the left hand," says Mr. Liston, "is then placed in the bottom of the wound about its middle, and directed upwards and forwards; any fibres of the transverse muscle, or of the levator of the anus, that offer resistance, are divided by the knife, its edge turned downward: the finger passes readily through the loose cellular tissue, but is resisted by the deep fascia, immediately anterior to which the groove of the staff can be felt not thickly covered. The point of the instrument is slipped along the nail of the finger, and, guided by it, is entered, the back still directed upwards, into the groove, at this point. The finger all along is placed so as to depress and protect as much as possible the coats of the rectum, and the same knife, pushed forwards, is made to divide the deep fascia, the muscular fibres within its layers," and to perforate the urethra about two lines in front of the prostate. Then it must be pushed gently into the bladder, slitting up the urethra and notching the margin of the prostate in its course. The knife being withdrawn, the left forefinger is gently insinuated into the bladder, dilating the parts as it enters; then the assistant having removed the staff, the forceps are cautiously introduced over the finger into the bladder; the finger being gradually withdrawn as the instrument enters. And, at this moment, Mr. Fergusson, with admirable dexterity, opens the blades, and catches the stone as it is brought within their jaws by the gush of urine that escapes. If, however, the stone is not caught in this ready way, the forceps must be closed and brought into contact with it—then the blades are opened over it and made to grasp it; if the stone is seized awkwardly, it is relinquished and seized again—then it is extracted by slow, cautious, undulating movements. The forceps should be held with the convexity of one blade upwards and of the other downwards; and the endeavour should be to make the parts gradually yield and dilate, not to tear them.

The *general maxims* to be borne in mind during the performance of this operation are, 1. to make a free external incision, and to bring it low enough down, so that the urine may subsequently escape freely without infiltrating the cellular tissue; 2. not to cut too high up, or to open the urethra too much in front, for fear of wounding the bulb or its artery; 3. not to wound the rectum, or pudic artery, by carrying the incisions too much inwards or outwards; 4. and above all, not to cut *completely through* the prostate, beyond its fibrous envelope, otherwise the urine will find a ready passage into the loose cellular tissue of the pelvis, and the patient will almost surely die.* The incision into the prostate should not be of greater extent than six or seven lines; its direction downwards and outwards, like the rest of the wound.

The varieties of this operation before alluded to are as follow. Most surgeons direct the assistant to hold the staff so that it may project in the perinæum, and incline a little to the left side of it,—and when they have opened the urethra, and are about to incise the neck of the bladder, they take its handle in their own left hand,

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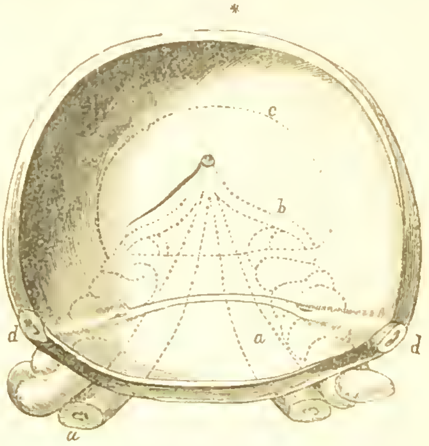
* We should not omit to mention that some great authorities, for instance, Cheselden, Martineau, S. Cooper, advocate a rather free incision of the neck of the bladder. For an interesting collection of opinions on this point, see Mr. Brittan's excellent Translation of Malgaigne's Operative Surgery.

and bring it down horizontally. Mr. Key preferred a straight staff. Again, there are great diversities in the manner of cutting into the bladder. Some persons use a *bistouri caché*, an instrument containing a blade that protrudes to a certain extent on touching a spring. Sir B. Brodie prefers a *beaked knife;* or, if the stone is very large, a double-edged knife with a beak in the centre, so as to divide both sides of the prostate. When the bladder is opened he directs the wound to be dilated by means of the *blunt gorget*, which distends the neck of the bladder, and splits cleanly through the prostate, without any risk of hæmorrhage or mischief. Many surgeons open the bladder by means of the *cutting gorget;* the beak of which being put into the groove of the staff, held horizontally in the operator's left hand, it is pushed cautiously on, and made to cut its way into the bladder. If this instrument is employed, every precaution must be used to keep it in contact with the staff, and not to let it slip between the bladder and rectum,—an accident that has been the death of not a few. In the case of a very large stone, it will be expedient to divide both sides of the prostate. This may be done, either by cutting into the bladder with a double-edged beaked knife—or after one side is incised in the ordinary way, by cutting through a little of the other with a probe-pointed bistoury, the edge of which should be directed towards the right *tuber ischii.* Lastly, there is a method which was occasionally employed by Cheselden, and which is still practised by a very experienced and successful lithotomist, Mr. C. Mayo, of Winchester. In this method, the operator, after making the usual external incisions, "cuts into the side of the prostate as far back as he can reach, and brings out the knife, along the groove of the staff, into the membranous part of the urethra;" thus making the incision into the neck of the bladder from behind forwards, instead of from before backwards, as in the other varieties.†



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* This diagram, copied from a paper by Mr. Bryan, Lancet, Feb. 11th, 1843, is useful as exhibiting an internal view of the parts at the neck of the bladder concerned in lithotomy; *a* vasa deferentia; *b* vesiculæ seminales; *c* prostate; *d* ureters.

† There has been very much dispute about this operation of Cheselden's; because he had two manners of performing it; the first, which was described

After Treatment.—When every fragment of the stone has been removed, and the bladder has been syringed with warm water, the patient should be put to bed. Dr. Nott, an American surgeon, is in the habit of passing a large catheter, and injecting a stream of warm water through it into the bladder, whilst the patient sits over a chamber pot. Every fragment is thus washed through the wound. The patient should lie on his back with his shoulders elevated; a napkin should be applied to the perinæum to soak up the urine, and the bed be protected by oilcloth. It is a good plan to introduce a large gum elastic canula through the wound into the bladder for it to flow through. If not, the surgeon should introduce his finger after a few hours, to clear the wound of coagula. Pain must be allayed by opium —the bowels be kept open with castor oil—the wound be kept perfectly clean, and then, in favourable cases, the urine begins to flow by the urethra in about one week, and the wound heals completely in four or five.

Complications.—1. Severe hæmorrhage may proceed from the pudic or bulbous arteries if wounded. If the bleeding orifice cannot be secured, it must be compressed as long as may be necessary with the finger. A general venous or arterial oozing must be checked by filling the wound firmly with lint or sponge—the tube being then indispensable. 2. Tenderness of the belly and other inflammatory symptoms must be combated by leeches, fomentations, and opiates. 3. Chronic inflammation of the bladder, with ammoniacal urine, by the measures directed at p. 516. 4. Sloughing of the cellular tissue from urinous infiltration, a frequent result of a hasty operation, and of too freely incising the neck of the bladder, is indicated by heat of the skin and sleepiness, followed by a rapid jerking intermittent pulse—hiccup—the belly tympanitic, the countenance anxious, and the other signs of irritative or typhoid fever. To be treated by wine, bark, and ammonia, by thoroughly opening the wound with the finger, and, if necessary, laying the wound into the rectum, so that the urine and fetid discharge may escape.

The Bilateral Operation is performed by making a curved incision, with the convexity upwards, from one side of the perinæum to the other—carrying it between the anus and bulb of the urethra—opening the membranous portion of the urethra—and then pushing a double *bistouri caché* into the bladder, by which both sides of the prostate may be divided.

The Rectovesical Operation consists in cutting into the bladder from the rectum, in the middle line behind the prostate.

The High Operation is performed by making an incision through

in the fourth Edition of his Anatomy, Lond. 1730, is that in which the prostate is divided in the manner commonly used at present, and which is now generally known as *Cheselden's operation*;—the second, which is spoken of in the text, is described in the fifth Edition of Cheselden's Anatomy, Lond. 1740; and the sixth Edition, 1741, p. 330. This it is which was described by Dr. Douglas; and which was performed by Mr. C. Mayo, as detailed by him in Med. Chir. Trans. vol. xi.

the linea alba, and opening the bladder (which is projected upwards on the point of a catheter); at its fore and upper part, where it is not covered by peritonæum. This operation may be occasionally resorted to when the stone is of great size, and the prostate much enlarged, or the space between the tuberosities of the ischia contracted.

LITHECTASY,[*] or CYSTECTASY. — In this operation, the membranous part of the urethra is cut into, and the prostatic portion dilated by fluid pressure, till it admits of a forceps being introduced to seize the stone.[†]

STONE IN WOMEN is much less frequent than it is in men, and when a renal calculus reaches the bladder, it is much more easily voided. If, however, there is a calculus too large to escape, it must be removed by dilating the orifice of the urethra, or by incision, or both. The great evil is the almost certainty that more or less incontinence of urine will follow either operation. To lessen the chance of which, Mr. Fergusson recommends that the dilatation should be effected very slowly, by means of a metallic or some other dilator, till it is capable of admitting the forefinger, when a forceps may be introduced to seize the stone. If this should not answer, and it seems necessary to make an incision, he recommends that the anterior half of the urethra—not its whole length into the bladder—should be divided to the extent of half an inch with a probe-pointed bistoury; after which sufficient dilatation might be effected with the forefinger oiled. The outer part of the urethra, which is the most undilatable part of it, would be alone divided by this operation, and the neck of the bladder, unless very roughly used, would speedily acquire its tone and use. In this way the eminent surgeon just quoted has extracted a stone three inches in circumference, and the patient had the power of retaining her urine immediately afterwards.[‡]

CHAPTER XXI.

OF THE DISEASES OF THE MALE GENITALS.

SECTION I.—OF THE DISEASES OF THE PENIS.

I. PHYMOSIS signifies a preternatural constriction of the orifice of the urethra, so that the glans cannot be uncovered without difficulty, if at all. It may be a congenital affection, or may be caused by the contracted cicatrices of ulcers. Besides the obstruction which it occasions to the functions of the organ, it prevents the washing away of the secretions from the corona glandis, and thus renders the patient liable to frequent *balanitis* and gleets, and in advanced age to cancer of the penis ; and it is a source of great trouble if he happens to be affected with the venereal disease.*

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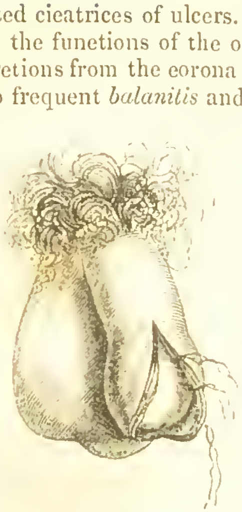
[*] Λιθὸς, *calculus*, and ἔκτασις, *extensio*.

[†] For further accounts and cases of this operation, vide Willis on the urinary organs; case (*fatal*) by Mr. Fergusson, recorded in Prov. Med. Journ. 5th August, 1843; one (*successful*) by Mr. Elliott, in Braithwaite's Retrospect, vol. vii.; another (*successful*) by Dr. Wright of Malton, Lond. Med. Gaz. vol. xxxiv.; and a paper by Dr. Arnott, Lancet, August 5th, 1843; also Ranking's Abstract, vol. iii. p. 119.

[‡] Practical Surgery, second Edition, p. 135.



Treatment. — A director should be introduced about half an inch between the glans and prepuce, and a curved, narrow, pointed bistoury be passed along its groove, by which the prepuce should be slit up. At the same time, if the edge of the prepuce is thickened, it should be seized between the blades of a forceps, and be shaved off. Then four or five fine sutures should be passed through the margin of the incision, so as to draw together the edge of the skin and that of the mucous lining of the prepuce, that they may unite by adhesion. If this is not done, the skin and mucous membrane will be separated by the swelling that follows the operation, and the wound, instead of being a mere line, will be half an inch wide.

II. PARAPHYMOSIS is said to exist when a tight prepuce is pulled back over the glans, constricting it, and causing it to swell.

Treatment.—The surgeon first compresses the glans with the fingers of one hand, so as to squeeze the blood out of it, then pushes it back with that hand, whilst he draws the prepuce forwards with the other. If this fails, the constricting part of the prepuce must be divided with a curved pointed bistoury.

III. CANCER OF THE PENIS generally begins as a warty excrescence or small pimple on the prepuce; but sometimes by an infiltration of the substance of the glans, which is converted into an indurated mass. It almost invariably occurs to elderly persons, who have had phymosis. The disease follows the ordinary course of cancer. After a time ulceration commences; or fungous growths sprout up; the discharge is fetid and irritating; the glands in the groin become affected, and the patient dies miserably.

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* "In the Jewish circumcision the child is wrapped in a cloth and laid across the thighs of a sitting man, by whom he is properly held. The circumcisor grasps the prepuce with the thumb and forefinger of his left hand, draws it forwards, and inserts it in the cleft of an instrument similar to a silver spatula. Then holding the prepuce and raising the penis upright he cuts off the former close to the plate with a single stroke of a button-ended knife. The circumcisor as quickly as possible seizes the inner fold of the prepuce with his thumb-nails, which have been specially cut for that purpose, and tears it immediately up to the corona glandis. He then spirts some water from his mouth upon the wound, takes the penis in his mouth, and sucks the blood out of it a few times. A strip of fine linen is then wound round the *corona* and the cut surfaces as a dressing, and the penis laid upon the pubes in a ring, to prevent its being touched."—South's Chelius, vol. ii. p. 345.

Treatment.—As a prophylactic, the above-described operation for phymosis should always be performed, if required. As a curative measure, amputation of the affected organ is the only resource, though, to use Dr. Walshe's words, "a singularly sorry one;" since all experience shows that the disease generally soon returns in the stump, or in the inguinal glands.

Operation.—The surgeon stretches out the penis with one hand, and cuts it off with one sweep of a bistoury; bleeding vessels are then to be tied, and cold to be applied, and after three or four days a piece of bougie is to be introduced into the orifice of the urethra, and to be retained there during the cicatrization.

IV. EPISPADIAS is a congenital malformation, consisting of an imperfect closure of the urethra on its upper surface. HYPOSPADIAS is a similar deficiency of the under surface. They sometimes may be relieved by paring the edges of the skin on each side of the fissure, and uniting it by suture, provided that the urethra is pervious to the end of the penis. An American surgeon has proposed to unite the edges of the fissure by cauterizing them with nitrate of silver, and then scraping off the black eschar; by which means the surfaces are made raw without hæmorrhage or loss of substance.

V. TUMOURS.—The natives of warm climates are liable to a sarcomatous growth of the cellular tissue of the penis and scrotum, forming an immense tumour in which those parts are completely buried. Poor Hoo Loo, the Chinese, had a tumour of this sort. Extirpation is the only cure, and if the tumour is very large, no attempt can be made to save the penis and testicles.

SECTION II.—OF THE DISEASES OF THE TESTIS.

I. ACUTE INFLAMMATION of the testis (*acute testitis, orchitis, hernia humoralis*) may be caused by local violence, but more frequently occurs in conjunction with gonorrhœa, through an extension of inflammation from the urethra. It is very liable to be induced if the patient indulges in violent exercise and fermented liquors, or neglects to use a suspensory bandage while employing injections.

Symptoms.—The discharge from the urethra diminishes, and the patient soon complains of aching pain in the testis and cord, extending up to the loins, and soon followed by great swelling, excruciating tenderness, fever, and vomiting. The mucous membrane of the epididymis is the part chiefly affected. The swelling depends upon an effusion of lymph and serum into the tunica vaginalis.

Treatment.—Bleeding if the habit is very plethoric; the application of numerous leeches, or the abstraction of blood from some of the veins of the scrotum; opium at night to allay pain; purgatives, especially F. 40, followed by tartar emetic in doses of a quarter of a grain,

F. 67, so as to keep down the pulse, and mercury, so as barely to affect the gums, if the disease does not readily yield to the tartar emetic alone; cold lotions or warm fomentations, according to the patient's feelings, and a suspensory bandage to elevate the part. After the acute stage has subsided, strong astringent lotions, F. 117, may be employed, and subsequently friction with mercurial ointment, in order to remove the hardness and swelling which (as the patient should always be informed) remain after the acute attack. As soon as the very acute stage has subsided, *compression* will be found a useful means of reducing the swelling, and supporting the dilated vessels. The affected testicle is grasped and separated from its fellow, and then is encircled with strips of adhesive plaster, which are to be applied regularly and as tightly as the patient can bear; the first strap being applied round the spermatic cord immediately above the testicle, and the others downwards in succession, slightly overlapping each other.*

II. CHRONIC INFLAMMATION (*sarcocele*) is known by more or less hardness, swelling, tenderness, and occasional pain. Very often it commences in the epididymis. It may be a sequel of acute inflammation, or may be caused by disease in the urethra, or disorder of the health. It sometimes depends on a syphilitic taint, which will be probable, if the patient has the aspect of secondary syphilis, if the pain is principally severe at night, and if there are secondary venereal affections of other parts. It very often, in its latter stages, is accompanied with some degree of effusion into the tunica vaginalis (*hydrosarcocele*). It may be distinguished from malignant disease, by the distinction between testis and epididymis not being lost; by its often affecting both testes; by the greater uniformity and smoothness of the swelling, its slower progress, and the absence of glandular enlargement in the groin. As it increases, the tumour softens in parts, thus again presenting similarity to malignant disease; but when it softens it is not so large as malignant disease would be. On examination, the testicle is found to contain a peculiar yellow deposit, which is interspersed in its substance, and, according to Sir B. Brodie and Mr. Curling, is deposited into the tubuli seminiferi, and may be found extending into the vas deferens.

Treatment.—The patient must be confined to his bed or sofa, calomel with opium be administered till it begins to touch the gums, the bowels be kept open, the diet nutritious but not stimulating, and the part be suspended. If an ordinary course of mercury seems inexpedient, the iodide of potassium, or corrosive sublimate, with sarsaparilla, F. 82, 86, &c. Tonics will probably be of service. The part may be frequently bathed with F. 118; or F. 160 may be applied with moderate pressure, as directed at p. 262.

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* This practice, which was first recommended by Fricke of Hamburg, was adopted by Ricord, and introduced into this country by Mr. Acton and Mr. Langston Parker; it seems to be generally approved of, and is recommended by Mr. T. Blizard Curling in his Practical Treatise on the Diseases of the Testis, &c., Lond. 1843; a work of the highest character, and greatest utility. See also Cæsar Hawkins, Lond. Med. Gaz. N. S. vol. iv. p. 943.

III. ABSCESS of the testis may be a result of chronic or scrofulous inflammation—very rarely of the acute. A puncture should be made so soon as fluctuation is clearly felt, and the skin is adherent. When an aperture is formed spontaneously or by art, a soft bleeding fungus, composed of the tubuli, and of granulations, is apt to protrude. This should be returned to its place by pressure with strips of plaster; and stimulating applications, such as the red precipitate, or a strong solution of lunar caustic, should be used in order to excite granulation. Should this fail, Mr. Syme's operation should be resorted to, of making two semi-elliptical incisions ( ), one on either side of the fungus, removing the narrow edge of skin around the fungus, and then bringing the healthy skin from either side over it, and employing sutures and other measures for procuring adhesion. To shave off the protruding substance would be almost equal to castration.

IV. SCROFULOUS INFLAMMATION commences with a deposit of tubercle into some part of the testis or epididymis, either into or between the tubuli. A nodular swelling appears externally, attended with very little pain or tenderness, which after a time inflames and bursts, and gives exit to the fungous protrusion just mentioned. It generally happens that the lungs are tubercular as well.

Treatment.—The health must be invigorated by tonics, alteratives, and change of air, and the local actions be excited by stimulating lotions. When all the tubercular matter has been evacuated, the abscess heals of itself; but, before this occurs, the whole organ is often disorganised and rendered useless, and sometimes it is necessary to remove it, on account of the irritation and drain on the system.

V. ATROPHY of the testicle may be a result of excessive venereal indulgence, or of inflammation; the part becoming filled with lymph, which first annihilates the tubular structure, and then is itself absorbed. The gland dwindles to the size of a pea. There is no cure.

VI. NEURALGIA of the testis and cord, produces fits of excruciating pain, which leave the parts tender and slightly swollen. The *treatment* must be that of neuralgia generally. All the secreting and excreting organs must be set in order. Violent purgatives in general do mischief. A few leeches, the application of intense cold, counter-irritants, and opiate or belladonna plasters, sometimes afford relief. The internal remedies most likely to do good are sarsaparilla, quinine, arsenic, and other tonics. Extreme sensitiveness of the testis, so that it cannot bear the slightest touch, in another form of this disorder sometimes met with in nervous hypochondriacal subjects; especially in persons who labour under a diseased condition of the urethra, or excessive spermatic discharges. Tonics and cold applications may be tried, and the cause of the affection should be ascertained, and if possible removed. In these cases, the patients often desire to be castrated. Before doing so, the surgeon ought to convince himself that the pain originates in a diseased state of the testis itself, as it sometimes does. If it depends on disorder of the viscera or general health, it might return in the cord, after the removal of the testis.

VII. The Hydatid or Cystic Disease is a rare affection, and occurs almost exclusively to adults. The testicle swells exceedingly, and its interior is filled with a number of cysts containing a watery fluid. They are supposed to be developed from dilated tubuli seminiferi; and their interstices are filled with a solid fibrinous substance. This affection is incurable, but not malignant. When the part becomes of unsightly magnitude, it must be removed.

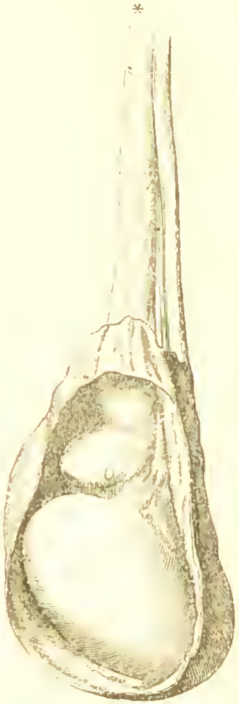
VIII. Malignant Disease of the testis is almost invariably medullary sarcoma, very rarely scirrhus. At first the gland swells, and becomes very hard and heavy; it is scarcely, if at all, painful or tender, and merely causes slight aching in the loins by its weight. After a time it enlarges rapidly and feels soft, the cord swells, there are occasional darting pains, a fungus protrudes, the lumbar glands become affected, and cachexia and death soon follow in the ordinary course. This disease is to be distinguished from hydrocele by its opacity and weight, and from chronic inflammation or the hydatid disease by the darting pains, swelling of the cord, and cancerous cachexia. It may further be distinguished from chronic inflammation by the fact, that neither mercury nor any other remedy produces any permanent benefit.

Treatment.—Dr. Walshe, as in all other cases of cancer, recommends a fair trial of the iodide of arsenic, and of pressure. He believes that castration as a remedy is almost utterly unavailing, since there is hardly an instance on record of permanent recovery after it, whilst in not a few cases, the patient's life has been brought to a speedy close from the effects of the operation.

IX. Castration is performed thus:—the scrotum being shaved, the surgeon grasps it behind to stretch the skin, and then makes an incision from the external abdominal ring to the very bottom of the scrotum. If the skin is adherent, or diseased, or if the tumour is very large, two elliptical incisions may be made, so as to remove a portion of skin between them. If there is any doubt as to the nature of the disease, he may next open the tunica vaginalis to examine the testis. Then he separates the cord from its attachments, and an assistant holds it between his finger and thumb, to prevent it from retracting when divided. The operator now passes his bistoury behind the cord, and divides it; and seizing the lower portion draws it forwards and dissects out the testicle. The arteries of the cord, and any others requiring it, are then to be tied; and the wound must not be closed till all the bleeding has ceased, as this operation is often followed by secondary hæmorrhage.

X. Hæmatocele signifies an extravasation of blood into the tunica vaginalis, in consequence of injury. It is sometimes combined with ecchymosis of the scrotum. If the quantity extravasated is small, cold lotions may cause it to be absorbed. If large, a puncture should be made, and a poultice be applied, for the blood to ooze into gradually. Blood may also be extravasated into the spermatic cord from local injury or strains.

XI. HYDROCELE signifies a collection of serum in the tunica vaginalis.



Symptoms. — It forms a pear-shaped swelling, smooth on its surface, fluctuating if pressed, free from pain and tenderness, and causing merely a little uneasiness by its weight. The epididymis can be felt on the posterior surface of the tumour near the bottom. On placing a lighted candle on one side of the scrotum, the light can be discerned through it.

Causes. — Hydrocele may be a sequel of inflammation of the testis, but more frequently arises without any local cause. It is often supposed to follow strains of the loins or belly.

Diagnosis. — Solid enlargements of the testis may be distinguished from hydrocele by their weight, solidity, and greater painfulness, and by the absence of fluctuation or transparency. The diagnosis from hernia will be found at p. 481.

Varieties.—It sometimes happens that the tunica vaginalis preserves its communication with the abdomen, and then becomes filled with serum, forming a cylindrical tumour extending up to the abdominal ring, to which the name congenital hydrocele is applied. On raising and compressing it, the fluid is slowly squeezed into the abdomen, and slowly trickles down again afterwards. This case is liable to be complicated with a *congenital* or *encysted hernia*, to prevent which, and to close the communication with the cavity of the peritonæum, a truss should be worn. Sometimes the transparency and fluctuation of hydrocele are absent in consequence of a thickening of the tunica vaginalis, which may be known, according to Brodie, by noticing that the thickened membrane forms a projection along the epididymis, whereas in solid enlargements of the testicle the projection of the epididymis is lost. Sometimes the tunica vaginalis is partially adherent to the testicle. Sometimes loose cartilages are found in the sac; they are easily removed by a slight incision.

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* Hydrocele. From King's College Museum.

Treatment.—The remedies for hydrocele are threefold. 1. Strong discutient lotions (F. 118, &c.), which sometimes assist the cure in children, but cannot be depended on for adults. 2. Evacuation of the serum, or the *palliative cure.* This may be accomplished by a puncture with a common lancet, or trocar; but the method most commonly adopted at present, consists in making a number of punctures with a grooved needle, so that the fluid may escape from the tunica vaginalis into the cellular tissue of the scrotum whence it is readily absorbed. This *palliative treatment* is always sufficient for children, but very rarely so in the case of adults.

3. *Radical Cure.*—This, which is generally necessary for adults, is performed by injecting certain stimulating fluids, or by introducing setons, or other foreign substances into the tunica vaginalis, in order to excite a degree of inflammation sufficient to destroy its secreting faculty. It must not be forgotten, however, that this *radical cure* is totally inadmissible if the testis is diseased, or if the hydrocele is complicated with an irreducible hernia, or if the tunica vaginalis preserves its communication with the abdomen. Mere thickening from *previous* disease is, however, no objection.

Operation.—The surgeon grasps the tumour behind, and introduces a trocar and canula into the sac, pointing the instrument upwards, so that it may not wound the testicle. He next withdraws the trocar, at the same time pushing the canula well into the sac, so that none of the fluid that is to be injected may pass into the cellular tissue of the scrotum. When all the serum has escaped, he injects from two to four ounces of some stimulating fluid through the canula, by means of an elastic bottle fitted with a stop-cock. Equal parts of port wine and water or zinc lotion (F. 117) are commonly used. Mr. Curling prefers common lime water. When the fluid has remained from three to five minutes, according to the degree of pain which it causes, it is suffered to flow out, and the canula is withdrawn. Some degree of inflammation follows, and more effusion into the sac—but the latter generally disappears in a fortnight or three weeks. If the cure is not quite perfect, the operation may be repeated after a few weeks. But the remedy most in favour at present is the tincture of iodine, which was used with very great success at Calcutta, by Mr. Martin. The disease is so common in the East, that Mr. Martin can refer to thousands of successful cases. The sac having been punctured with a small trocar and canula, about one or two drachms of a mixture of one part tincture of iodine, and two of water are injected and allowed to remain in the sac. Mr. Fergusson uses for this purpose a small glass syringe, with a silver or platinum nozzle made to fit the canula. One advantage this method certainly has; namely, that there is much less chance of extravasation into the scrotum, than when the sac is filled with many ounces of fluid.

XII. Varieties of Hydrocele.—1. *Encysted Hydrocele.* Sometimes a serous cyst is developed on or near the testis. Most frequently it is situated between the tunica vaginalis and epididymis; very rarely between the tunica vaginalis and testis, and more rarely still within the substance of the external layer of that tunic. These cysts contain a clear water, and not serum. They may be punctured with a grooved or cataract needle to let the fluid escape, if they have become of inconvenient bulk; and if it is necessary to adopt some radical method of cure, the best plan seems to be to pass a common silk ligature through the sac with a curved needle, and retain it till it has caused some inflammation. 2. *Hydrocele of the spermatic cord* may consist either of an encysted tumour, such as has just been described, or else of a collection of serum in the cellular tissue of the cord. In either case, the needle must be employed if the swelling becomes troublesome from its bulk.

XIII. Varicocele (*Cirsocele* or *Spermatocele*) signifies a varicose state of the veins of the spermatic cord. It is caused by the ordinary causes of varix; that is to say, by obstruction to the return of blood, through corpulence, constipation, tight belts round the abdomen, and the like. It is much more common on the left side than on the right; obviously because the left spermatic vein is more liable to be pressed upon by fæcal accumulations in the sigmoid flexure of the colon, and because its course is longer and less direct than that of the right vein.

Treatment.—In ordinary cases, sufficient relief may be obtained by keeping the bowels thoroughly open; by frequently washing the scrotum with cold water or astringent lotions, so as to constringe the skin; and by supporting it with a suspensory bandage, made of good stout *jean*, braced firmly up to a band passing round the abdomen. But there are some cases in which this disease produces very serious inconvenience—pain in the scrotum and loins—sense of dragging at the stomach—loss of appetite—flatulence—and despondency of mind—and for these cases, something more must be done. Mr. Wormald recommends the loose skin of the scrotum to be pinched up and confined with a steel ring. Blisters and counter-irritants, so as to inflame and condense the scrotum; division of the veins by the knife or caustic, and passing setons of thread through them, have had their advocates; and even the barbarous operation of passing a ligature through the scrotum, and tying up the skin of half the scrotum, with all the vessels except the artery and vas deferens, so that they may be divided by ulceration, has been practised in some cases with success; in others with fatal results; but certainly always with a risk of causing atrophy of the testis. Sir A. Cooper proposed the operation of cutting away a good piece of the loose relaxed skin. "The manner of performing it is as follows:—The patient being placed in the recumbent posture, the relaxed scrotum is drawn between the fingers; the testis is to be raised to the rim by an assistant; and then the portion of the scrotum is to be removed by the knife." Any artery requiring it must be tied; and cold must be applied to check bleeding; and then the lower flap of the scrotum must be brought upwards and forwards, and be attached by sutures to the fore and upper part; and a suspensory bag should be applied to press the testis upwards, and glue the scrotum to its surface. It is of no use to remove too little of the skin.

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* Encysted hydrocele. From a preparation in the Middlesex Hospital Museum.

The method which appears most promising at present, consists in the application of moderate pressure to the dilated veins at the external abdominal ring, by means of Evans's patent lever truss; so as to release them from the pressure of the superincumbent column of blood, and afford them a moderate degree of support.*

SECTION III.—DISEASES OF THE SCROTUM.

I. Acute Œdema of the Scrotum.—The loose cellular tissue of this part is exceedingly liable to serous infiltration, from inflammation or dropsy. But there is one form of acute œdema, which has been particularly described by Mr. Liston,† and which is liable to supervene on excoriations of the parts in unhealthy persons. The scrotum becomes enormously swollen and tense, and soon sloughs unless a free incision is made in the mesial line. The case very much resembles extravasation of urine, but may be distinguished by the absence of swelling in the perinæum, and of obstruction in micturition.

II. Cancer Scroti.—This disease is commonly called the *Chimney-sweeper's Cancer*, because it is very seldom met with except amongst that class of men, and because the irritation of soot lodging in the ridges of the scrotum is believed to be the cause of it. It may be remarked, however, that some other irritants are believed to have the same effect on the scrotum. Thus, it is stated on the authority of Dr. Paris, that smelters are liable to a similar disease. And, on the other hand, soot may produce this disease on other parts besides the scrotum.

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* Vide Sir A. Cooper, Guy's Hosp. Rep. vol. iii.; Reynaud, Journ. des Connaissances Méd., Feb. 1839; James in Prov. Med. Trans. for 1840, and Curling op. cit. The diagnosis of Varicocele has been spoken of at p. 481.

† Med. Chir. Trans. vol. xxii.

It usually commences as a florid vascular wart, called the *soot-wart.* This gradually spreads, affects the whole scrotum and neighbouring part of the penis, and ulcerates, producing a fungous sore with ragged edges, discharging a thin offensive matter, and causes so much pain and constitutional disturbance as ultimately to destroy life.

This is probably in all cases a cancroid, or semi-malignant affection, and the fungous growths consist, as in a case examined by Hughes Bennett, of hypertrophied epithelial scales, and thickened dermis, and not of cancerous deposit. Thus the fact is readily explained that the free and full extirpation of all the diseased portions of skin by the knife, is generally successful as a means of cure.*

SECTION IV.—OF IMPOTENCE.

IMPOTENCE in the male may depend on a variety of conditions. 1. It may be caused by absence, or mutilation, or malformation, or original weakness and want of development of the genital organs. 2. After a severe and tedious illness, the genitals may remain incapable of performing their functions, long after the restoration of the health and strength in other respects. Steel and other tonics, with cantharides, musk, extract of nux vomica, resin of Indian hemp, galvanism cautiously applied to the spine, spices, eggs, and oysters, are the remedies. Phosphorus in doses of gr. $\frac{1}{20}$ F. 191, is said to be a potent *aphrodisiac* in these cases. 3. Blows on the head, or spine, are apt to be followed by impotence; which sometimes is relieved, but more frequently is permanent. A cautious course of mercury; followed by the stimulating aphrodisiacs just mentioned, are the remedies most likely to be of use. A similar result sometimes follows a fit of apoplexy. 4. Certain diseases are always attended with a diminution, and sometimes with a complete loss of sexual power; especially diabetes, diseases of the kidneys, some forms of dyspepsia; and the latter stage of most chronic organic diseases. 5. It often happens that a young man, the first time he yields to carnal temptation—or that a newly married man on the night of his nuptials, finds himself incapable of accomplishing his wishes—through awkwardness, or timidity, or over anxiety on his own part, or, perhaps, from something disagreeable in his bed-fellow. He straightway fancies himself impotent—and if he applies to one of the advertising Jewish scoundrels, will no doubt be told that he is so. The surgeon should cheer the patient's spirits, and should inform him that his case is by no means uncommon—that most other men feel the same incapability at times; and he should give him a little nitric æther and cinnamon water, and make him promise to sleep with the lady three nights without touching her, which will sometimes prove an effectual cure. Yet these are difficult cases to manage; because the disease is in the mind and not in the body. It is most difficult to persuade the patient that his disease is imaginary; and he is far too ready to think that the honest surgeon does not understand his case. 6. Lastly, impotence may be produced by premature and excessive venery, or by the practice of self-pollution. Such cases frequently come under the observation of the London surgeon, who has no difficulty in distinguishing them from the last variety. The sexual organs have been rendered in these cases so weak and irritable, that the least excitement from a lascivious idea or from the mere friction of the clothes, brings on an imperfect erection followed immediately by the discharge of a thin fluid. The erection is so imperfect, and followed so soon by the discharge, that the patient is quite incompetent for sexual connexion; and the frequent and abundant losses of seminal fluid (whence the term *spermatorrhœa* is given to this malady), together with the patient's consciousness of his own imperfection, bring on a most miserable state of bodily weakness and mental despondency. General tonics, and cold shower bathing will do something to relieve this state; but the most essential thing is, the observance of *perfect chastity* of idea, so that all excitement may be avoided. The prostatic portion of the urethra in these cases, is almost always preternaturally irritable and sensitive; and this condition of the parts at the orifice of the seminal ducts tends greatly to keep up the excessive secretion, and to promote the action by which it is expelled. It is a very important indication, therefore, to attack this irritable surface, destroy its sensitiveness, and so interrupt the chain of morbid phenomena. This may be effected by the use of nitrate of silver according to the plan proposed by M. Lallemand. The *porte caustique* is passed down the urethra, and as soon as it arrives at the painful part, the caustic is protruded for an inch, and passed backwards and forwards rapidly once or twice, then the instrument is withdrawn. This is followed by more or less pain, and thin bloody discharge; sometimes by severe inflammation: but the spermatorrhœa is almost invariably benefited at once. Injections of thin mucilage, containing one grain of opium and three of acetate of lead to the ounce, have been recommended by Mr. Douglas, of Glasgow, as less painful, and equally efficacious; the author can confirm this statement.* Enemata of cold water, the introduction of the common bougie three times a week; cold or tepid salt-water hip-baths; and small doses of cubebs with henbane, are useful adjuncts to the treatment. The author has seen several cases in which a preternatural irritability of the ejaculatory apparatus, with involuntary nocturnal emissions, even of a bloody fluid, together with very great pain in the back, languor, and despondency of mind, have been caused by the presence of irritating urine, containing oxalate of lime, and cured by the means described in the section on Urinary Deposits. Vide F. 21, 22, &c.

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* Vide Walshe, op. cit.; Hughes Bennett, op. cit., p. 126.

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* Vide B. Phillips, Med. Gaz., 23rd Dec., 1842: Curling, op. cit. Douglas, Med. Gaz., 22th Sept. 1843.

CHAPTER XXII.

OF THE SURGICAL DISEASES OF THE FEMALE GENITALS.

I. Blennorrhœa.—Young female children are sometimes subject to mucous or purulent discharges from the parts at the entrance of the vagina; which may also perhaps be excoriated. Purgatives, tonics, soap and water, and astringent lotions are the remedies.

II. Noma signifies a phagedænic affection of the labia pudendi of young female children, precisely resembling the *cancrum oris*, p. 414, in its causes and nature, and symptoms. After two or three days of low fever, the little patient is observed to suffer considerably whilst making water, and on examination, the labia present a livid erysepelatous redness and vesications, that are rapidly followed by phagedænic ulcers. This disease is very frequently fatal. The treatment is the same as directed for cancrum oris. The surgeon must be very careful not to mistake this or the preceding affection for the venereal disease; an error common enough among parents.*

III. Vesico-Vagina Fistula signifies a communication between the bladder and the vagina. It generally results from sloughing of the parts after a tedious labour. As soon as it is discovered, the patient should be made to lie on her face—a catheter should be constantly worn in the urethra, and an oiled sponge in the vagina, and the bowels should be kept moderately loose. By these means the natural contraction of the parts will be aided. After some weeks, it will be expedient to pare the edges of the fissure, and unite them by suture, by means of Mr. Beaumont's instrument; or if this fails, to touch them frequently with nitrate of silver, or to apply the actual cautery at intervals for a few months. If these means fail, or if the patient will not submit to them, Dr. Reid's plan of plugging the vagina with an India rubber bottle, appears to be the best means of preventing the constant dribbling of urine.

IV. Recto-Vaginal Fistula must be treated by constantly wearing a sponge in the vagina, so as to prevent the passage of fæces through it, and by mild laxatives. If after a time the aperture does not close, it must be treated as in the last case. *Complete laceration of the perinæum into the anus* is attended with distressing incontinence of fæces, and is prevented from healing by the action of the sphincter. Hence it is necessary to divide the sphincter on each side of the laceration, then to sew together the edges of the laceration, and to prevent the new wounds from uniting, by placing a few threads of lint in them, until the laceration has united.

V. A Vascular Excrescence, varying in size from that of a large pin's head to that of a horse-bean, is liable to grow from the female urethra. It causes great distress through its exquisite sensibility. It should be cut off, and the potassa fusa be applied to the surface to prevent its reproduction. But, immediately after the caustic, a sponge dipped in diluted vinegar should be applied, in order to prevent injury to the surrounding sound parts: and if it is necessary to introduce the caustic within the urethra, it must be by means of a tube which has an aperture in it corresponding to the diseased surface.

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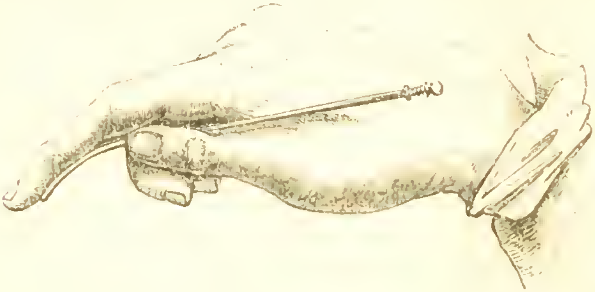
* Kinder Wood on a fatal affection of the pudenda of female children. Med. Chir. Trans. vol. vii. p. 84.

VI. The Catheter may be easily introduced into the female urethra with one hand thus:—The surgeon holding it like a pen, but



with its point on the tip of the forefinger, passes the forefinger between the labia, and feels for the meatus. The catheter is then easily slipped into the orifice. Either hand may be used, according to the patient's position in bed.

VII. Imperforate Hymen.—Sometimes this membrane completely obstructs the vagina, and causes the menstrual fluid to accumulate and distend the uterus. The impediment is easily got rid of by a crucial incision. Then all the black treacly fluid that has accumulated should be immediately syringed out with warm water, otherwise it might putrefy, and cause typhoid fever and death. The abdomen should be bandaged, and the patient be confined to her bed till the uterus has resumed its healthy size.

VIII. Varicocele.—Enlargement of the veins of the labia, forming a soft tumour which enlarges when the patient rises, and increases so as to form a most painful impediment to exercise, but disappears when she lies down.

Treatment.—Cold bathing, and support by a firm truss, or T bandage with a pad.

IX. The labia may be the seat of acute inflammation, and of encysted tumours, which perhaps may be connected with the round ligament; of hernia, and of sarcomatous or fatty enlargements. The treatment of these cases requires no distinct comments. The clitoris and nymphæ, if they grow to an inconvenient size, should be curtailed by an incision—and if they are affected with scirrhus, should be entirely extirpated at an early period.

CHAPTER XXIII.

OF THE DISEASES OF THE BREAST.

I. Hypertrophy of the breasts to an enormous size, is very common during the earlier months of pregnancy in plethoric women. Aperients will assist time in effecting a perfect cure. In unmarried women the same thing sometimes happens; the breasts becoming so large as to be a perfect burden. If there are any remedies they are the preparations of iodine, and the various means for ensuring the healthy action of the womb.

II. Acute Inflammation of the breast (*acute mastitis* *) is known by great swelling, tenderness and pain, and fever. These symptoms are generally soon succeeded by formation of matter. The abscess, if confined by the fascial envelope of the organ, is very slow to point. This affection may occur at any period during lactation. It may be caused by cold—by too stimulating a diet—by neglect in suckling—by irritation propagated from the nipples, and by a loaded state of the bowels and defective biliary and urinary secretion. The suddenness with which it may come on is sometimes surprising. A woman may get up apparently well; may be seized with shivering, pain, swelling of the breast, violent fever, and delirium; and these symptoms as suddenly subside when calomel and black draughts have cleared away some most offensive motions.

Treatment.—Purgatives, leeches, and fomentations or poultices after them; the milk should be drawn off, if it can be done without very much pain, and Dover's powder should be given to allay restlessness. The arm should be kept quiet in a sling. As soon as fluctuation is well established, a puncture should be made. And then efficient support should be given by bandages, or by cross strips of soap or other mild adhesive plaster, so as to take off the weight of the organ, compress the distended vessels, and prevent all bagging of matter. Likewise if after leeches and purgatives, the tenderness and pain diminish, so that there seems a chance of resolution without suppuration, similar support is most useful. See the remarks on Acute Abscess, p. 58. One of the two following cuts shows the manner in which the breast may be supported by a roller; the other shows how strips of plaster may be applied for the same purpose. Of course, a sufficient number of strips should be applied to cover the entire breast, except the nipple, or at least the lower half of the organ.

III. Chronic Inflammation generally attacks one or two lobules only, causing them to swell into firm tumours, which, on examination with the finger, are felt to be composed of numerous little granules.

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* We must make a passing protest against such a word as *mazoitis*, with which a promising surgeon has burdened the nomenclature of his art.

The whole gland may however be affected. There is very little tenderness or pain, except at the time of menstruation. This affection is distinguished from malignant disease, by the circumstance that the patient is generally young, without the leaden look of cancer; that the tumour is not so hard, and that the skin, nipple, and lymphatic glands are unaffected. The indurated lobules may suppurate, and form an abscess, which should be opened early.

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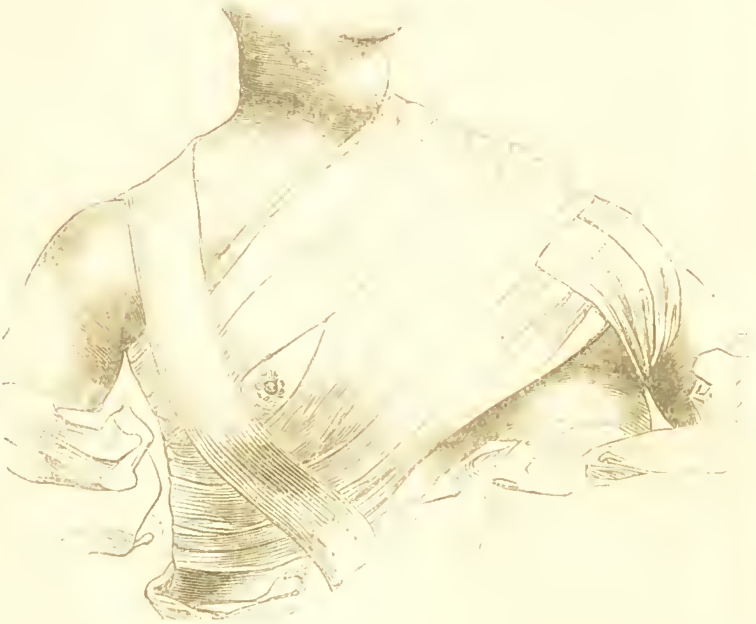

Treatment.—The appetite and digestion—the state of the liver and bowels, and above all, of the uterine system, must be regulated by Plummer's pill, aloes, steel, iodide of potassium, cod-liver oil, and other alteratives, aperients, and tonics. Occasional leeches—cold lotions—mercurial plasters, containing a little belladonna, or friction with weak mercurial ointment, and iodine paint diluted, are the requisite local remedies.

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* In applying this bandage, a few turns should first be made round the opposite shoulder and axilla, so as to get a purchase from that point. Then the bandage should be passed behind the back, up under the breast, and over the opposite shoulder; finishing by bringing the end of the bandage over the shoulder of the affected side, as represented, and pinning it to the folds that envelope the breast, so as to keep them up in their place. The patient from whom the sketch was taken had unusually pendulous breasts.

The *chronic tumour* of the breast, and the so called *fibrinous tumour*, are small tumours situated upon and attached to the glandular structure of the breast, and consisting, according to Mr. Birkett, of a development of imperfect glandular tissue (*imperfect hypertrophy*). They require the same treatment as we have just detailed; except that if any one of these growths becomes very painful, and cannot be checked by other means, it may be excised.

IV. Irritable Breast is a neuralgic affection resembling the irritable testis. Extreme pain and tenderness, aggravated at the menstrual period, with occasional heat and slight swelling, are the symptoms. This, like the other affections of its class, is extremely unmanageable, and may remain for years.

Treatment.—Steel, aloes, and other tonics—emmenagogues—especially the ferri ammonio-cloridum in doses of gr. ii. ter die—with change of air, marriage, and other means for the improvement of the health—are the chief remedies. Leeches, cold and warm applications—mercurial, belladonna, and other plasters—issues, blisters, and other local measures, sometimes do good, but as often the reverse.

V. Lacteal Tumour.—Sometimes a lacteal duct becomes obliterated, and the milk accumulates in it, forming an oblong fluctuating tumour near the nipple. If this is punctured, milk will continue to be discharged during lactation, and, after the child is weaned, it will dry up and heal. In a few very rare instances there has been formed a

VI. LACTEAL CALCULUS.—The fluid part of the milk in an obstructed lacteal duct having been absorbed, whilst its more solid and earthy ingredients remained, and concreted into a calculous mass.

VII. ABSCESS IN THE LACTEAL TUBES.—An elderly woman ap plied to the author some time since with a painful, elongated swelling, stretching from the nipple to the circumference of the breast. It evidently consisted of a lacteal tube which had suppurated; and, after being punctured and yielding half an ounce of pus, it soon got well.

VIII. SORE NIPPLES.—Excoriations and chaps about the nipples not only cause great pain and inconvenience in suckling, but are a frequent cause of acute inflammation of the breast. A solution of gr. v. of tannin in an ounce of water; or a touch with lunar caustic, if there is a very deep irritable fissure, are the best remedies; lotions of borax, alum, or sulphate of zinc, and arrow root and cream, are also common applications. The nipple should be defended from the clothes, and from the child's mouth, by a metallic shield. Women who are subject to this affection, should frequently wash the parts with salt and water, or solution of alum, during pregnancy; or should apply every night a liniment composed of equal parts of rectified spirit and olive oil.

IX. THE TRUE HYDATID DISEASE consists in the development of a parent cyst, containing other secondary cysts, consisting of parasitic animalcules (*echinococcus hominis*) floating in a clear limpid water. It presents a globular oval hard tumour, attended with more or less pain, but no derangement of the general health. As it increases, fluctuation becomes perceptible, and the skin becomes distended and ulcerates. The cyst may be punctured, and allowed to suppurate, or may be excised, which is preferable.*

X. CYSTIC AND SEROCYSTIC DISEASES.—These diseases, which were particularly described by Sir B. C. Brodie,† have lately been most satisfactorily unravelled and explained by Mr. Birkett, in his published Jacksonian Prize Essay, on Diseases of the Breast.

It appears that cysts may be originally developed in two modes—viz., 1st, by a dilatation of portions of the tubular and secretory apparatus of the gland; 2ndly, by errors of nutrition in its fibrocellular envelope.

1. The cysts produced by a dilatation of the tubules or acini of the gland, may be one, or many; may be situated on the surface, in the centre of, or behind the organ; and may be of various sizes, though rarely larger than a filbert; they have an investment of fibrous membrane, are lined with epithelium, and enclose a yellow, reddish, or green mucous fluid, containing milky and fatty globules and epithelium, which last accumulates after a time, and renders the contents of the cyst more solid. Serous fluid sometimes exudes from the nipple.

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* Vide Birkett on Diseases of the Breast, Lond. 1850.

† In a lecture delivered at St. George's Hospital, in January 1840.

2. The second kind of cyst is formed by an effusion of fluid into the meshes of the fibro-cellular tissue, which becomes condensed into a cyst around it, and becomes lined with an epithelium of hexagonal scales. Such cysts may occur singly and attain enormous size, or may be numerous and of variable sizes, and may be situated in any part of the organ. And now there comes a most interesting pathological process. Into the cysts thus formed there project growths arising from the gland and consisting of imperfectly developed gland tissue, which gradually increase, and fill them up. This disease affects, as Sir B. Brodie observes, the upper classes chiefly, and is not often met with in hospitals. It may affect women of any age from puberty to the cessation of menstruation. It is usually of slow progress, and does not affect the constitution. On examination one or more tumours can be felt, smooth and firm. Enlargement takes place gradually, and if the disease is left to follow its course, the skin becomes distended and thin, and ulcerates, forming a rounded punched-out aperture, from which fungus-like growths shoot forth. At last the affected breast may attain enormous bulk, and may contain cysts of every variety of size, blended with fibrous growths :—" cysts containing fluid only ; cysts containing fluid, and intra-cystic growths, vascular and pendulous, very soft and gelatinous, in other instances of the most fibrous and solid nature." Of course, although not carcinomatous, such a morbid growth may wear out the vital powers.

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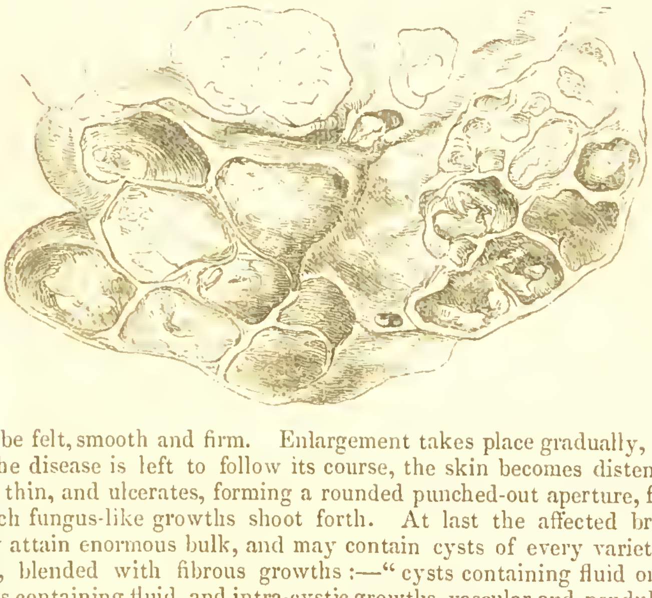

Treatment.—If there is a single cyst with fluid contents, it may be perhaps obliterated by puncture which will be followed by suppuration, and by pressure. In the early stages Sir B. Brodie recommends counter-irritation by means of blisters, or tincture of iodine, or by flannel cloths soaked in a combination of sp. camphoræ, sp. tenuioris āā fʒiiss; liq. plumbi f℥i; intermitting these applications when the skin becomes sore. But in most cases the breast must be amputated, and if the whole of it is removed, the disease will not return.

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* From a preparation of the late Dr. Hooper's, now in the King's College Museum. It shows a cyst empty, others partially filled, others entirely filled with new growth.

XI. Scirrhus generally commences as a hard, circumscribed, moveable swelling in some part of the breast. In its early stages, it is not often tender or painful, and perhaps is only discovered by accident. After a few weeks or months, however, it increases in size, and becomes tubercular in its outline; and now becomes affected with paroxysms of violent lancinating pain, which are said to be most apt to occur about the period of menstruation. Not unfrequently a little bloody fluid is discharged from the nipple. The cellular tissue and fat about the gland often become atrophied, so that the diseased breast is smaller than the sound one, and the nipple is generally drawn in, and the skin around it puckered like a cicatrix. The disease may, however, commence, not as a distinct tuberous deposit forming a tumour *in* the breast, but as a general infiltration of the whole organ, which becomes a hard, heavy, tuberculated mass. But in either case the progress and termination of this disease are such as have been already often described. The tumour after a time invades the entire gland, which adheres to the skin, and to the muscle beneath, so as to become fixed and immoveable. Then it ulcerates and forms a cancer. The glands in the axilla, and sometimes those in the neck, enlarge, and compress the axillary veins, and the arm swells and becomes œdematous from the obstruction to its circulation. The ribs and pleura become scirrhous; water is effused into the chest; the breathing becomes difficult; the patient suffers from rheumatic pains in the bones, and at last dies. The rapidity of this disease is most uncertain. But Sir A. Cooper used to say that it was generally from two to three years in attaining its full growth; and from six months to two years afterwards in destroying life.

Diagnosis.—In well marked cases this disease cannot be mistaken. The stony-hard, moveable swelling in its early stage, or the shrunken gland and retracted nipple subsequently; the age about forty; the leaden, sallow complexion; the weakness and cachexia; the lancinating pain; and the circumstance (which very often happens) that the patient's mother or sisters have suffered from cancer, all distinguish it. But there are several circumstances which may render the diagnosis doubtful. 1. In the first place the scirrhous deposit may be attended with more or less common inflammatory pain, tenderness, and swelling, so that it loses its characteristic hardness, and becomes blended in its outline with the surrounding tissues, and exactly resembles the swelling arising from chronic inflammation. 2. It may occur in a young female between twenty and thirty. 3. The effect of remedies may be deceitful, for they may, perhaps, diminish the inflammatory swelling around, and so cause a temporary decrease of the tumour, though not of its scirrhous portion.

Treatment.—The local and general treatment of scirrhus of the breast must be conducted on the principles laid down in the chapter on Malignant Disease generally. We can only reiterate the opinion there given of the almost hopelessness of remedial measures of any kind.

The œdema of the arm, which is often such a distressing complication of the later stages of this disease, may be somewhat retarded by bandages, and by keeping the limb in an elevated posture. Blisters near the shoulder, and punctures of the skin may be tried when it becomes excessive.

XII. MEDULLARY SARCOMA of the breast is generally combined with more or less scirrhus, and rarely exists alone. It forms a large rapidly increasing tumour; lobulated on its surface; and the projecting parts yield an elastic sensation. This affection may be distinguished from scirrhus by its more rapid growth and greater softness. It is often difficult in its early stage to distinguish it from innocent chronic tumours, more especially as the latter may after a time become the seat of malignant growths. *Melanosis* and *gelatiniform sarcoma* are sometimes, though rarely, found in the breast.

XIII. EXTIRPATION OF THE BREAST is thus performed: The patient being placed in a convenient position, sitting or reclining, an assistant takes the arm of the affected side and holds it out, so as to put the pectoralis on the stretch. The surgeon then makes a semi-elliptical incision below the nipple along the lower border of the pectoralis major, and another on the upper and inner side of the nipple, so as to include that part between them. He next dissects out the lower and outer part of the gland, quite down to the pectoralis (taking care not to get behind that muscle), and then, cutting from below upwards, he separates the remainder. If an adjacent gland is enlarged, the incisions should be managed so as to include it also. When the mass is removed, its surface should be wiped and examined, and the wound should also be well examined, to ascertain that no part of the gland, and that no hardened or discoloured portions of cellular tissue or of muscular fibre, are left behind. Arteries are then to be tied, and the patient to be put to bed, and when all oozing has ceased, a few strips of adhesive plaster may be applied. If desirable to effect gentle pressure on the wound, to stop oozing, a small flat sand-bag, says Mr. Birkett, may be placed upon the flaps.

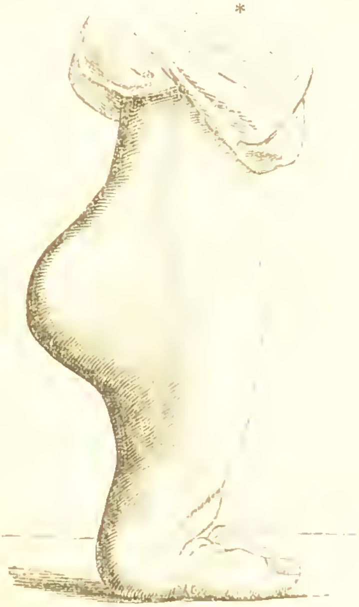
XIV. BOYS AND GIRLS about the age of puberty are subject to slight swelling and tenderness of the breast, which soon disappears of itself if not interfered with.

XV. MEN occasionally suffer from malignant disease of the breast, which manifests itself in the same manner, and requires the same treatment, as it does in the female.

CHAPTER XXIV.

OF THE DISEASES OF THE HANDS AND FEET, CLUB-FOOT, AND OTHER DEFORMITIES OF THE LIMBS.

I. Club-Foot (Talipes) signifies a peculiar deformity of the foot, produced by rigidity and contraction of the muscles of the leg. 1. In the most simple variety, which is called *talipes equinus*, the heel merely is raised, so that the patient walks on the ball of the foot. 2. In the *talipes varus*, which is far more common, the distortion is much more complex. In the first place the heel is raised; secondly, the inner edge of the foot is drawn upwards; and thirdly, the whole foot is twisted inwards; so that the patient walks on the outer edge, and in confirmed cases, on the dorsum of the foot, and outer ankle. The next figure shows the talipes varus. 3. In the *talipes valgus* the outer edge of the foot is raised up, and the patient walks on the inner ankle.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Causes.—This affection consists essentially in that state of shortening and rigidity of the muscles of the calf, which we have described as *rigid atrophy* (vide p. 207). The exciting causes are various circumstances that interfere with the supply of nervous influence, or with the proper nutrition of the muscles. Thus it may be a consequence of fevers; of injuries of the spine; of diseases of the brain; of division of the sciatic nerve; of long confinement and inactivity; of repeated attacks of rheumatic or other kinds of inflammation of the muscles of the calf; or it may be a sympathetic consequence of irritation of the bowels, or of some other part of the system; and lastly, it may be *congenital*, or produced during uterine life. As a proof of the imperfect nutrition and innervation of the distorted limb, it is always cold and feeble; the bones are small, and the muscles wasted.

Treatment.—If this distortion is congenital, or commences in early

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[*] Talipes equinus, from a cast in the King's College Museum.

childhood, it may sometimes be rectified by constantly wearing a proper apparatus. Slight cases in particular, occurring to children after fevers, may generally be remedied, if taken at their very commencement, by daily extension with the hands, and friction of stimulating embrocations on the muscles, together with tonics, galvanism, change of air, and sea-bathing. But in confirmed cases, it is better at once to resort to Stromeyer's operation of dividing the tendo Achillis. The rationale of this operation may readily be comprehended. The tendon being divided, heals by a callus, which renders it longer, and which, while recent, may be stretched to any desired length. Thus the mechanical shortening of the muscle is neutralized. At the same time, the antagonist muscles, which are always wasted and inert, are relieved from a constant state of tension, and are enabled to resume their natural functions, so that the limb rapidly increases in strength and bulk. The operation is easily performed thus: The tendon is put on the stretch; and a narrow sharp-pointed knife is thrust through the skin on one side of it; then its edge is turned against the tendon, and made to divide it as it is being withdrawn. If the tendons of the tibialis posticus, or flexor pollicis; or in fact if any others offer an obstacle to bringing down the heel, they may be divided as well. It is often expedient to divide a portion of the plantar fascia, or of the muscles of the sole of the foot. As soon after the operation as it can be done without causing too much pain, some apparatus should be applied to extend the callus and bring the foot into its proper shape. *Stromeyer's footboard* is recommended by Dr. Little, but *Scarpa's shoe*, as improved by Weiss, seems to be neater and more efficient. It is admirably adapted for counteracting the threefold distortion of talipes varus.

II. Weak Ankles.—In this affection the foot is flattened, its arch is sunk, and the astragalus forms a projection below the internal malleolus, rendering the internal border of the foot convex instead of concave. In bad cases the inner ankle almost touches the ground, and the patient walks with great pain and lameness. This affection depends on a weakness and relaxation of the bones and ligaments. It is sure to be brought on, if weakly children are put upon their legs too soon. It is more common amongst girls than boys—partly from their greater delicacy—partly because they are taught at an early age by ignorant governesses and dancing masters, that it is necessary for them to turn their feet out as much as possible, as the very first step towards elegance in dancing or walking. Thirty years ago it was a common practice to make school girls sit for an hour every day in a kind of stocks, with their feet turned outwards so as to be almost in a straight line with each other. Children, however, if left to nature, stand with their toes slightly turned inwards—the position in fact which is the firmest, and most calculated to prevent this distortion whilst the bones are yet soft and yielding.

Treatment.—The patient should wear shoes or boots with high heels, and with the inner edge of the sole much thicker than the outer. He should also be directed to turn the foot out very little, if at all. Benefit may also be derived from a well-applied bandage, such as is represented at p. 75. It should always be applied so as to be carried round the ankle from the inner side of the foot. In severe cases the patient should wear a tightly fitting boot with a piece of steel or whalebone fastened to the sole, and passing perpendicularly upwards to the middle of the inner side of the leg.

III. Knock Knees are treated by Mr. Lonsdale on the same principles as the crooked ricketty leg; by adapting a long well-padded splint to the outer side of each limb, fastening it below by straps and buckles at the outer ankles, and above by a broad belt, to which both splints are attached, and which is buckled round the body at the level of the hollow part of the loins. The splints should be hindered from coming too far forwards, and should bear well against the trochanter and outer ankle. Meanwhile, the knee is to be drawn into its proper place by a band, buckled over it, and wide enough to embrace both the head of the tibia, and condyles of the femur.*

IV. Contraction of the Toes.—It often happens that one of the toes is permanently elevated, and rides over its neighbours, from the habitual use of narrow boots; and the upper surface of this toe being peculiarly exposed to friction, is generally covered with corns so painful, that many persons have been compelled to have the part amputated. Division of the extensor tendon may, however, enable the toe to be brought down into its place, and prevent the necessity of its removal.

V. Bunion.—A bunion signifies a distortion of the metatarsal joint of the great toe; which is thrown outwards, so that the head of the metatarsal bone projects and forms a swelling on the inner side of the foot. The skin covering it is generally very thin; sometimes, however, thickened from inflammation, or from the development of a bursa underneath. This affection is produced, partly by the use of tight boots, which cramp the toes together, and force the great toe outwards, in order to make the foot fashionably pointed; and it is partly a consequence, as Mr. Key has shown, of a weak, flattened state of the foot, which throws the extremity of that metatarsal bone forward, and the toe outwards. The ligaments of the joint are thus stretched and thickened, the joint is rendered unnaturally prominent and subjected to pressure and friction, a bursa forms over it, and there is a constant state of tenderness and pain, varied with fits of inflammation.

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* Lonsdale, Med. Gaz., June, 1849.

Treatment.—The patient must wear proper shoes, so arranged as not to press on the tender part. Mr. Key recommends the great toe to be kept in its proper place by means of a partition in the stocking like the finger of a glove, and a partition of strong cow's leather fixed in the sole of the shoe. But it is almost an impossibility for a person who walks about to use such contrivances. A mercurial plaster on soft leather often gives great comfort. If the bursa inflame, it must be treated by rest, leeches and poultices, in order to avoid suppuration and the necessity of a puncture, which is sure to lead to an inveterate fistula; for which Mr. Key says that a weak solution of creosote is the best application.*

VI. Contraction of the Fingers generally depends on shortening and rigidity of the palmar aponeuroses and tendinous sheaths, or on a ligamentous degeneration of the cellular tissue on the palmar aspect of the fingers.

Treatment.—Friction with oily liniments, and extension upon splints, may be of some service. But the following operation will be of more: a longitudinal incision may be made through the skin on the palmar surface of the first phalanx, then the edges of the wound being held asunder, a curved bistoury may be passed under the contracted tissues so as to divide them. If any of the muscles of the fore-arm are rigid, their tendons may be divided by a narrow knife as in the operation for club-foot.

VII. Webbed Fingers.—This is a deformity consisting of an union of the fingers to each other. It may be congenital, or may be caused by burns. It is a most intractable affection. Mere division of the connecting skin is not often of any avail, for the fingers almost inevitably grow together again when the wound heals. In order to counteract their union, a flap of skin may either be brought from the dorsum of the hand and be engrafted between the fingers, or, as Mr. Liston proposes, a perforation may first of all be made in the connecting skin near the roots of the fingers, and be prevented from closing by keeping a piece of cord in it till the edges have healed, and then the remainder of the connexion may be divided.

VIII. Ulcers about the nails.—1. A very common and troublesome affection is that which is popularly termed "*the growth of the nail into the flesh*," and which most usually occurs by the side of the great toe. It does not, however, arise from any alteration in the nail, as its name would imply, but the contiguous soft parts are first swelled and inflamed by constant pressure against its edge from the use of tight shoes. If this state be permitted to increase, suppuration occurs, and an ulcer is formed with fungous and exquisitely sensible granulations, in which the edge of the nail is embedded, and which often produces so much pain as totally to prevent walking.

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* Vide Key on Bunion, Guy's Hosp. Rep. vol. i.; and Fergusson's Practical Surgery, p. 252.

Treatment.—The objects are, to remove the irritation caused by the nail, and reduce the swelling of the soft parts. In most cases, if the nail, having been well softened by soaking in warm water, is shaved as thin as possible with a knife or file or bit of glass, the pain and irritation may easily be allayed by rest for a day or two, with fomentations and poultices; and then any ulcer that has formed will soon heal, with the aid of black wash on lint, or a touch of lunar caustic, or a lotion of a grain of sulphate of copper to an ounce of distilled water. But if the case is more obstinate, the edge of the nail may be removed, by passing the sharp blade of a pair of scissors resolutely under the nail, cutting it through, and then quickly tearing away the offending portion with forceps. The pain attending this operation renders chloroform expedient. If the complaint return after this, the whole nail had better be dissected out, together with the gland that secretes it. Persons disposed to this affection should always wear loose shoes, and keep their nails scraped rather thin, so that they may be flexible. The author would remark, that the swelled state of the feet which renders corns and all other affections of the feet painful, may generally be relieved by a saline purgative.

2. ONYCHIA MALIGNA is a peculiarly unhealthy ulcer occurring at the root of the nail, either of the fingers or toes, but more frequently of the latter. It commences with a deep red swelling, and an oozing of a thin ichor from under the fold of skin at the root of the nail; and lastly, an ulcer is formed, with a smooth tawny or brown surface, a very fetid sanious discharge, and swelled jagged edges of a peculiar livid dusky hue. It is in general extremely painful, especially at night.

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Treatment.—Mr. Wardrop recommends mercury to be employed, so as to affect the gums in about a fortnight; and says that then the swelling will generally subside, and the ulcer become clean. The mercurial effect should be continued gently till the sore is healed, and for a short time afterwards. The best local applications are solution of arsenic (liq. arsen. ʒij. ad aq. ℥ij.), as recommended by Mr. Abernethy, which will generally be found to succeed; solution of corrosive sublimate (P. L.), of nitrate of silver, black and yellow wash, and other compounds of the same description. Fumigation by means of a candle made with a drachm of vermilion to an ounce of wax, is also useful.†

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* From a cast in the King's College Museum.

† Vide Lawrence, Lectures in Med. Gaz.; James Wardrop, F.R.S.E., on Diseases of the Toes and Fingers, Med. Chir. Trans. vol. v.

IX. WHITLOW, or PARONYCHIA, signifies an abscess of the fingers. There are three kinds; the *cutaneous*, the *subcutaneous*, and the *tendinous*. The cutaneous whitlow consists of inflammation of the surface of the skin of the last phalanx, with burning pain, and effusion of a serous or bloody fluid which elevates the cuticle into a bladder. The subcutaneous is attended with greater pain and throbbing, and suppuration *under* the skin at the root of the nail, which may come off.

Treatment.—Search should be made for foreign particles sticking in the skin; purgatives should be given, and the part be fomented in hot water; but if these measures do not speedily cause resolution, a pretty free incision should be made into the inflamed part. If the tip of the finger is long painful and tender without suppurating, it should be well pencilled with lunar caustic. Aperients and tonics are always of service. The resin ointment is recommended by Mr. Vincent as an application, after the part has been opened.

The *tendinous whitlow*, or *thecal abscess*, affects the deeper seated tissues, and was described at p. 209. We may observe here, however, that the finger should be freely laid open with a scalpel. If matter have extended into the palm, the incision should be continued along the metacarpal bone till it freely gushes out. It is better not to cut into the spaces *between* the metacarpal bones, (unless matter points there very decidedly indeed), for fear of wounding the digital artery. If it be necessary to slit up the palmar fascia, a cut should be made over the head of a metacarpal bone, in order that a director may be passed under it.

X. SPURIOUS ANCHYLOSIS.—In cases of *spurious anchylosis* (p. 271)—that is to say, stiffness of joints depending on rigidity of the surrounding tissues, or on permanent contraction of the flexor muscles owing to their having been long kept in a fixed position, division of the tendons of the contracted muscles will do much towards restoring the mobility of the joint. The tendons of the hamstring muscles have been divided by Mr. Philips with great success in a case of stiffened knee from rheumatism. The pectoralis major, latissimus dorsi, teres major and teres minor muscles have been divided by Dieffenbach in order to effect the reduction of an old dislocation of the shoulder; and the pectinæus and sartorius by an American surgeon, in a case of contracted hip. All these operations are, of course, to be performed by what is called *subcutaneous section*; that is, in the same manner in which the tendo Achillis is divided. The muscle or tendon must be put on the stretch, and a puncture be made on one side of it. Then a curved blunt-pointed bistoury may be passed under it, and be made to divide it. In many cases it is necessary to divide the fasciæ under the knee or in the sole of the foot, as well as the tendons. A few days after either of these operations some apparatus must be applied by which gradual extension may be made.

PART V.

OF THE OPERATIONS OF SURGERY.

CHAPTER I.

OF OPERATIONS IN GENERAL.

I. The Apparatus necessary for operations in general comprises one or more bistouries, scalpels, or other specific cutting instruments; a dissecting forceps, a tenaculum, and small forceps (which should have a spring or catch) to take up arteries; plenty of well-waxed ligatures, curved needles threaded, fine sponge, water both warm and cold, and wine and hartshorn in case of faintness. There should also be a sufficient number of assistants—there should be one whose sole business it should be to administer the chloroform, and to watch its effects, and others to keep the patient in a proper position, to hand the different instruments to the surgeon, or to assist him in other respects—besides a good light, and a bed or table, with pillows or cushions to make the patient's position as convenient as possible. Mr. W. Fergusson gives the useful hint that it is desirable to have delicate instruments made to shut in a handle like a pocket clasp-knife; so that they may be kept in the surgeon's waistcoat-pocket till they are wanted, and that their edge or point may not be injured through the carelessness of the assistants.

"The temperature of cutting instruments should be raised," says M. Malgaigne, "to that of the body; since cold metallic sounds pass with more difficulty into the urethra, and the razor cuts better after being warmed." *

II. Incisions.—In making incisions, there are several points that demand attention. First of all, the manner of handling the knife, which, as systematic writers say, may be held either like a common dinner knife, or like a pen, or like a fiddle-stick. The first two positions are those which are employed commonly; the third is resorted to in cutting into the different layers over a hernial sac, and in

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* Malgaigne's Operative Surgery, translated by F. Brittan, Lond. 1846.

sundry other delicate operations. Secondly, before commencing an incision, the skin must be gently stretched and steadied with the points of the fingers, otherwise it will be dragged along by the knife, and the incision will be ragged, and shorter than was intended. Thirdly, in cutting through the skin, the knife should be passed in at right angles to the surface, and should be at once carried down to the subcutaneous tissue—then the blade should be inclined downwards, and be made to cut through the skin to the requisite extent, and lastly, as the incision is finished, the instrument must be again brought to a right angle with the surface. By these means the whole thickness of the skin will be cleanly divided, both at the beginning and end of the incision. Timid operators are apt to make the incision through the skin too limited, which embarrasses their subsequent proceedings: besides that cutting more of the skin subsequently (unless the patient is under the influence of chloroform) is very painful.

The author has not sufficient space to detail all the tedious varieties of incisions that are enumerated in systematic treatises. It is of little use to say that they may be made by cutting from without inwards, or by first plunging in the instrument, and then cutting outwards (as in bleeding), or that they may be simple or compound—straight, curved, or angular. It may be noticed, however, that when two incisions are to be made to meet near their extremities (as, for example, the two semi-elliptical incisions in amputation of the breast), the second should fall into the first *nearly*, but *not quite at its extremity*, so that there may be no little isthmus of skin left undivided between them. Again, in making a V incision, the second cut should not be begun where the first terminated, but at its other end; that is to say, it should be made *towards* the first, and not *from* it. In making a T incision likewise, the transverse cut should be made first, and the other be directed towards it. Lastly, the angle of a V incision should, if possible, be always dependent.

III. THE PREPARATION of a patient for an operation is a most important element in its success. The object is to have every organ and every function in as healthy and tranquil a state as possible. For the full-blooded and inflammatory, bleeding may be requisite, and in all cases recourse should be had to regular diet, aperients, and gentle alteratives, with or without small doses of sedatives, till the pulse has become quiet, the tongue clean, the bowels regular, the liver, kidneys, and skin in good order, and the mind cheerful. Moreover, it is best not to perform an operation in very cold weather, if it can be avoided, especially upon the eye. It has also been recommended, and the recommendation seems rational, that the patient should be made to keep his bed for two or three days before an operation, in order that he may become accustomed to the confinement.*

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* Dr. Norman Chevers, and Mr. T. Wilkinson King, have shown that in most cases of death after operations, one of the great depurating organs of the blood—either the liver or kidneys—is diseased.

IV. THE AFTER TREATMENT is no less important, and should be conducted so as to ward off the most probable sources of danger—whether sinking from shock, or from loss of blood, or the occurrence of inflammation. The characteristic tendency of disease, at the present day, is decidedly toward phlebitis, erysipelas, diffused inflammations, and other maladies of a *low type;* and as we observed, when speaking of the prevention of phlebitis, it is most important that the patient should be supplied with beef-tea, and other nourishment, in sufficient quantity to maintain a healthy state of blood; and that he should be kept quiet. One of the most successful surgeons in London, always gives his patients half a grain of opium every five or six hours for the first two or three days after an operation, for the purpose of tranquillizing the nervous system, and his success proves the benefit of the plan.

V. AIR IN VEINS.—The entrance of large quantities of air into a vein is a most dangerous accident, that has sometimes occurred during the extirpation of tumours from the neck or axilla. A large vein being cut across, whose coats adhere to some firm textures around, so that they cannot collapse, a sort of bubbling, sucking noise is suddenly heard, the patient instantly faints, and generally dies soon afterwards. On examination the heart is found distended with air. If any such sound should be perceived during an operation, the surgeon should instantly put his fingers on the spot that it proceeds from, and the patient, if faint, should be kept in the recumbent position with the head low; and should be well plied with brandy. The air has no noxious properties in itself, and if introduced slowly, in small quantity, does no harm; large quantities prove fatal by interfering mechanically with the action of the heart.*

CHAPTER II.

OF THE MINOR OPERATIONS.

I. EXTIRPATION OF TUMOURS.—A different proceeding is to be adopted in the case of malignant and of simple growths. In the former it may be necessary to remove a portion of skin by two semi-elliptical incisions, if it appears to be contaminated by the diseased growth. But in extirpating wens or fatty or sarcomatous tumours, however large, it is a general rule not to remove any of the skin, unless it is much inflamed or ulcerated, or so entirely adherent to the tumour that its separation would be very tedious and difficult. Again, in the former case it is necessary to cut quite wide of the diseased mass, and remove plenty of the surrounding tissues, in the latter case the incisions should be carried through the cellular cyst of the tumour. In all cases it is a better plan (unless the tumour is exceedingly large) to carry the dissection at once boldly to the deepest part where the largest vessels enter the tumour, than to tie the different branches as they are divided, by which means some vessels may perhaps be tied more than once. Again, it is requisite in every case that the extirpation be complete, because if the smallest portion is left, it may become the nucleus of a fresh growth. If, therefore, it is found that there is any portion of a tumour which cannot be cut out without fear of dangerous hæmorrhage, a double ligature should be passed through its base, and be tied tightly on each side of it.

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* For the best account of these curious cases, refer to Sir C. Bell's Practical Essays, Lond. 1841.

II. VENÆSECTION at the bend of the arm should always, if possible, be performed in the median-cephalic vein. A ligature being placed a little above the elbow (but not tight enough to stop the pulse at the wrist), the operator takes the forearm in his hand, places his thumb on the vein a little below the intended puncture, and then (using the right hand for the right arm and *vice versâ*) pushes the lancet obliquely into the vein, and makes it cut its way directly outwards. When sufficient blood has been taken, the surgeon should untie the ligature above the elbow, and place his thumb on the bleeding aperture. Next he should put a little bit of lint on the wound, and secure that with a strip of plaster, only removing his thumb sufficiently to admit of the application. Then he should remove his thumb enough to put on a little square compress of linen, and over that the middle of a bandage. This is to be passed round the elbow in the form of a figure of 8, and the two ends are to be crossed and turned backwards over the compress. The next figure is intended to show the way in which the surgeon should grasp the arm, and keep his thumb over the bleeding aperture till the bandage is secured.

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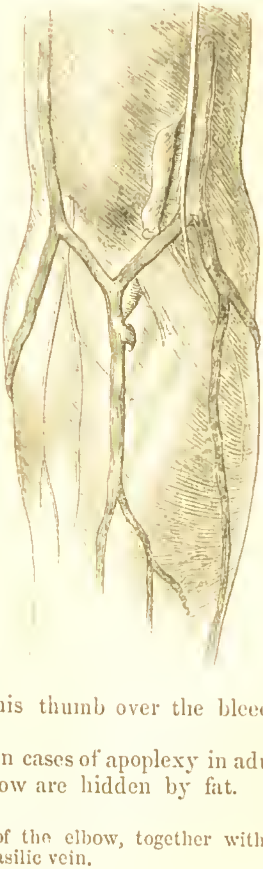

The jugular vein is sometimes opened in cases of apoplexy in adults, and in children if the veins at the elbow are hidden by fat. The patient, if a child, being laid in a nurse's lap, with his head towards the surgeon, the latter puts his left thumb on the vein a little above the clavicle, and then opens it with a lancet, cutting towards the thumb, and in a direction downwards and inwards, so that the incision may cross the fibres of the platysma. When blood enough has been taken, the wound should be closed with lint and plaster, and not till then should the thumb be removed.

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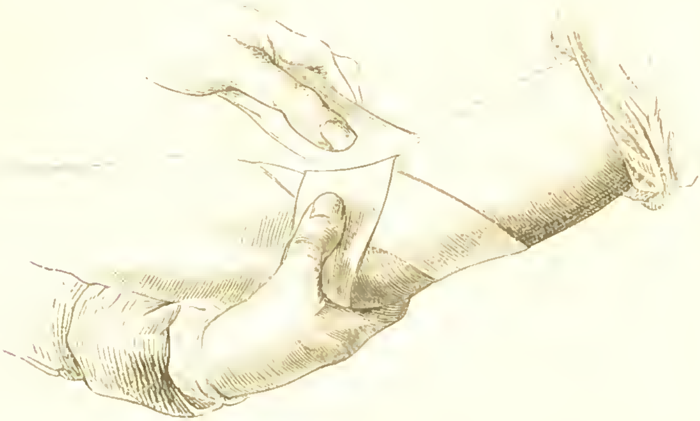
* This cut shows the veins of the bend of the elbow, together with the relation of the brachial artery to the median basilic vein.



The veins in the leg, scrotum, or neighbourhood of the eye or ear, can readily be opened in the same manner instead of the ordinary mode of venæsection, or leeching, or cupping.

Abscess in the cellular tissue, inflammation of the fascia, phlebitis, neuralgia, varicose aneurism, and aneurismal varix, are occasional ill consequences of venæsection.

III. Arteriotomy.—The temporal artery should be opened above the outer angle of the eyebrow—not just above the zygoma. The surgeon feels for the largest branch, steadies it with two fingers, one placed above, and the other below the intended puncture—then pushes in the lancet in the same manner as in venæsection. The incision should be directed across the vessel, and should cut it about half through. When sufficient blood has flowed, the best plan is to introduce the lancet, and cut the vessel completely across, so that its ends may retract. A firm graduated compress should then be applied, and be confined with a bandage passing round the head; and some degree of pressure should be kept up on the wound for a week or ten days. Any subsequent bleeding or spurious aneurism must be treated by completely dividing the artery, if it has not been done already, and by pressure; but if the wound is much inflamed or ulcerated, so as not to admit of pressure, a transverse incision should be made on each side of it, and the artery be tied in both places.

IV. Cupping.—The patient being placed in a comfortable position, with towels arranged so that his clothes may not be soiled by the blood, and being moreover protected from cold, so that the flow of blood to the surface may not be checked, and the operator having his scarificator, glasses, torch, spirits of wine, lighted candle, hot water, and sponge, conveniently arranged on a table close by; the first thing is to sponge the skin well with hot water, so as to make it somewhat vascular. The operator next dries it with a warm towel, and adapts his glasses to the part. Their number must depend on the quantity of blood to be taken—from three to five ounces is a fair calculation for each glass. In the next place, he dips the torch in the spirit, sets it on fire, introduces it for half a second into one of the glasses, and immediately claps the latter on the skin—and the same with the other glasses in succession. As soon as the skin has become red and swollen, he charges the scarificator, and takes it between his right forefinger and thumb, at the same time holding the lighted torch between the little and ring fingers of the same hand. He then detaches one glass by insinuating the nail of his left forefinger under its edge—instantly discharges the scarificator on the swollen skin, and as expeditiously as possible introduces the torch into the glass, and applies it again. The same process is repeated with the other glasses. When they become tolerably full, or the blood begins to coagulate in them, they must be detached in succession and re-applied, if blood enough has not been taken—and when the operation is finished, the wounds should be closed with lint and plaster. There are several points connected with this operation that require notice. In the first place, the glasses must not be exhausted too much; if they are, the pressure of their rims will occasion severe pain—the blood will not flow—and the operation will very probably be followed by a considerable ecchymosis. Secondly, the position of the glasses must be slightly varied each time they are applied, so that their edges may not again press on the same circle of skin. Thirdly, the expediency of not burning the patient needs scarcely be hinted at. Fourthly, in taking off the glasses, the upper part of each should be detached first, so that the blood may not escape. Lastly, the length of the scarificators must be adjusted to the thickness of the skin; for if the incisions are too deep, the fat will protrude through them, and prevent the flow of blood. The direction of the incisions should correspond to the course of the muscular fibres beneath; but this is of no great consequence. For *cupping on the temples* smaller glasses and scarificators are employed. A branch of the temporal artery is generally wounded, and the flow of blood may be expedited by slightly lifting the lower part of the rim of the glass. Pressure should be kept up on the wounds for some days afterwards, in order to prevent secondary hæmorrhage or false aneurism.

V. ACUPUNCTURE is easily performed by running in five or six needles with a rotatory motion. It is certainly very efficacious in some cases of neuralgia, but it is by no means easy to explain its operation. Acupuncture is also resorted to in anasarca, when the skin is much distended; and we have spoken of its utility in hydrocele, ganglion, hydrothorax, and ascites, for the purpose of permitting the serum to exude into the cellular tissue.

VI. Issues may be made by caustic or by incision, or by the actual cautery. The first may be made either by rubbing a portion of skin of the requisite extent with the potassa fusa, or by making a paste with equal parts of the potass and soft soap, and laying it on the skin till the latter is converted into a black slough. The parts immediately around the issue should be protected with several layers of sticking plaster. After the application of the caustic, the part should be poulticed till the slough separates, and then the sore may be prevented from healing, either by binding several peas firmly on its surface, or by touching it occasionally with the caustic. The second species of issue is made by pinching up the skin, and slitting it up with a lancet, and then introducing some peas to prevent it from healing. It may be remarked, that issues should never be made over projecting points of bones, nor over the bellies of muscles; for they might degenerate into most obstinate sores. Thus, for diseased vertebræ. the issues should be made between the spinous and transverse processes; for diseased hip, *behind* the great trochanter, and not over it; for diseased knee, just below the inner tuberosity of the tibia. Issues if indolent or irritable, should be healed up. They are only of use, says Mr. Vincent, when the actions carried on in them are vigorous and healthy.

VII. The Actual Cautery is certainly a very efficient, and it is very far from being the most painful, manner of effecting counter-irritation. On the contrary, its effects are speedy, and not attended with very much suffering. It is easily effected by means of an iron rod with a knob of the size and shape of an olive at one end of it, and a wooden handle at the other. The knob being heated red hot, is rubbed on the skin so as to make two or three blackened lines about half an inch wide, and an inch asunder. Then the cold water dressing or a poultice may be applied till the shallow eschars separate; and it appears to be better to keep the sores open by touching them occasionally with the cautery, than by the ordinary irritating dressings.

VIII. Setons are introduced by pinching up a fold of the skin, and pushing a needle through it armed with a skein of silk or cotton, or a long flat piece of India-rubber. As soon as one or two inches of the thread are brought through, the needle is cut off. A fresh portion of the thread is to be pulled through the wound every day, so as to keep up a constant irritation and discharge. If the discharge is insufficient, the thread may be covered with some irritating ointment before it is drawn under the skin.

IX. The Moxa is a peculiar method of counter-irritation long practised in the East, and occasionally employed in Europe, for the relief of chronic nervous and rheumatic pains, or for chronic diseases of the joints. One or more small cones, formed of the fine fibres of the artemisia chinensis, or of some other porous vegetable substance—

such as German tinder, or linen impregnated with nitre, are placed on the skin over the affected part, and then are set on fire, and allowed to burn away so as to form a superficial eschar. The surrounding skin must be protected by a piece of wet rag, with a hole in it for the moxa.

It is convenient sometimes to use the moxa as a rubefacient or vesicant, and not as a cauterant. A roll of German tinder ignited may be held with dressing forceps at a little distance from the skin, the surgeon at the same time blowing upon it with a blow-pipe, till the skin becomes red.

X. VACCINATION.—The matter should be taken on the seventh or eighth day, before an inflamed areola is spread around the vesicle, and it should be *lymph*, clear and transparent, not purulent. The operator should make three punctures on one arm with a fine lancet, carrying the point of the instrument obliquely under the cuticle for about one-eighth of an inch, and, if possible, without drawing blood. Then, if he has a patient to take the matter from, he ruptures a portion of the vesicle, dips the lancet in the lymph, and inserts it into each puncture. If he has the matter on *points*, he should breathe on them so as to liquefy it, and then insert one into each puncture, and allow it to remain three or four minutes.

XI. ELECTRICITY AND GALVANISM.—In certain cases of defective circulation and nervous influence; when the thigh is weakened and benumbed after sciatica; in cases of atrophy of the extremities after fever; when the extensors are paralyzed from long disuse, as after disease of joints; in deficient menstruation; in loss of voice from relaxation of the mucous membrane of the fauces; in hysterical neuralgia, these powerful agents may be resorted to with every prospect of benefit. But the cases to which they are most applicable, are those of asphyxia, from poisoning, or hanging, when the affusion of cold water, and other stimulants, fail to excite the action of respiration. The best method in these cases is, to place one wire at the nape of the neck, and the other at the pit of the stomach; or, if the sensibility is so feeble that this fails to take effect, a needle may be inserted deeply between the eighth and ninth ribs on either side, so as to reach the diaphragm, and the current be passed between them. The most convenient apparatus seems to be a single battery on Smee's or Daniell's principle, with a coil wound around a piece of soft iron, which is thereby converted into a temporary magnet, and with a contrivance for interrupting the circuit, and giving a stream of gentle shocks.

XII. GALVANO-PUNCTURE.—In obstinate neuralgia it is a good plan to insert two needles deeply, at two points in the course of the nerve, and to pass a galvanic current through them.

Corrigan Bou. How applied?

CHAPTER III.

ON BANDAGING.

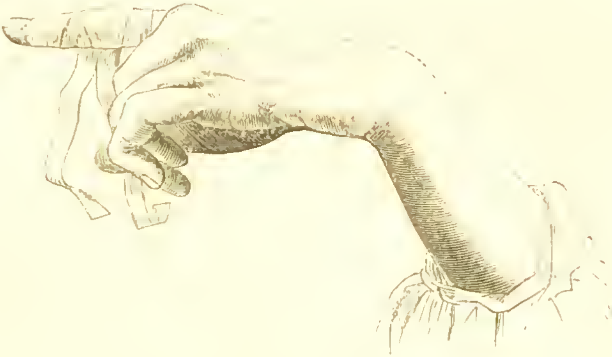
I. The Art of Bandaging is so easily learned from practice, and so impossible to teach merely from books, that in former editions of this work we dismissed it with as few words as possible. In the present edition, however, in deference to the judgment of some of our friends, we shall say rather more upon it; yet we shall endeavour to avoid that strange complexity which some writers delight in, who have invented bandages with such names as "Compound-Bis-Axillo-Scapulary," "Compound-Metatarso-Rotular," &c., and who seem to assume a knowledge of millinery as well as of surgery on the part of their readers.

II. Bandages usually consist of a strip of linen, calico, or flannel, varying in breadth from one to three, five, or more inches, and in length from one to six, eight, or twelve yards. Sometimes they are made of India-rubber web, or of a substance like stockings; but, for most purposes, stout unbleached calico, or thin fine calico, sold by Ewen in Jermyn-street, will answer. They are generally rolled up longitudinally for use, and hence have received the name of *rollers*. Besides the simple roller, there are many compound bandages, as the T bandage, and the many-tailed bandage (described at p. 257); but the latter are not now much in use, and, like other special bandages, are generally prepared by professed bandage-makers. Lastly, bandages may often be made out of handkerchiefs, or square pieces of linen.

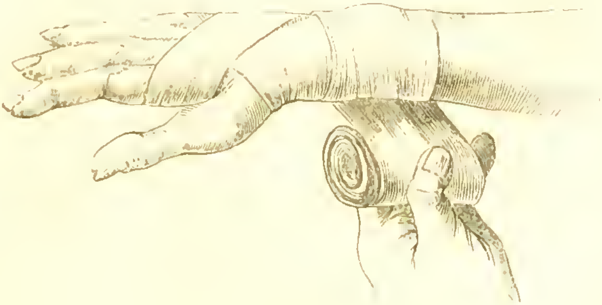
III. Uses.—Innumerable are the properties assigned to various forms of bandages by the older writers; hence such names as the *retentive*, *expulsive*, *uniting*, *dividing*, *recurrent*, &c. We believe, however, that we shall not be far from the truth if we state the chief uses of bandaging to be these two, viz., 1st. To keep on dressings, to protect a diseased part from injury, and put some little restraint upon its motions; 2ndly, To afford a support to relaxed muscles, ligaments, and vessels. Deprive any part of its normal support, and varicose veins and dropsical effusions are sure to occur; and conversely many œdematous and other chronic swellings of the limbs and joints may often be cured by the proper application of bandages alone.

IV. The Roller.—In applying this to any limb, the surgeon should hold it as represented at p. 75, or in the next figure but one, and should pass it from one hand to the other as he encircles the limb with it. He should begin at the extremity of the limb, applying it most tightly there, and a very little more loosely as it ascends. He should unfold very little of it at a time, and should make each fold overlap about a third of the previous one. When the limb increases in size, he must turn the bandage on itself after the manner depicted in the cuts.

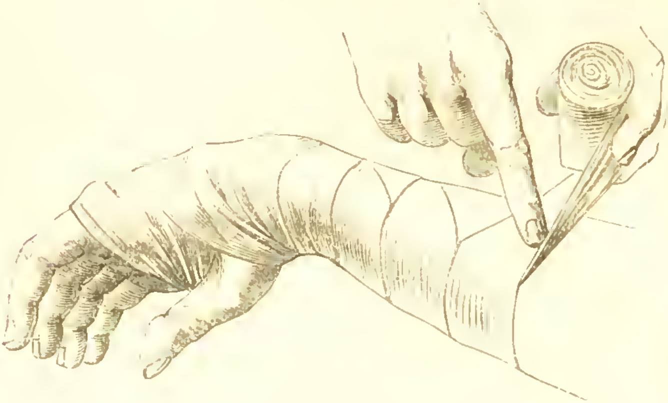
V. Bandage for the Finger.—This is a simple strip of linen, that may be wound round the finger a few times with the requisite tightness. We introduce the figure in order to show how to fasten it neatly without pins or stitches, by merely splitting up the end of the bandage into two tails, which may be turned opposite ways round the finger, and be tied in a bow. This is a most convenient way of keeping dressings on the penis.



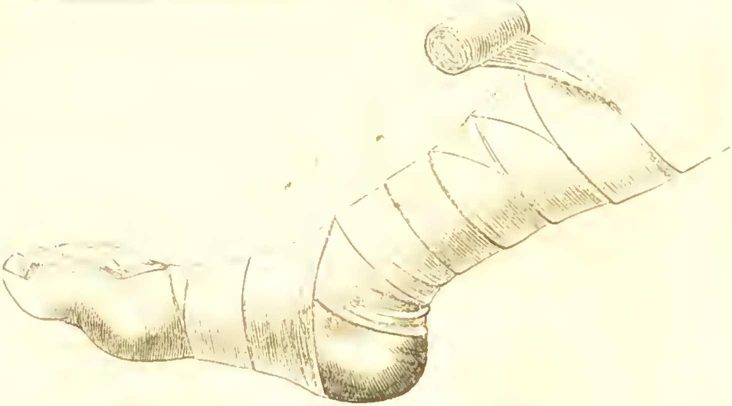
VI. For the Hand.—A bandage about two inches wide may be passed in a figure of 8 round the hand and wrist, excluding the thumb, and may be finished by one or two circular turns round the wrist.



VII. For the Fore-arm.—After applying it about the hand and wrist as just described, carry it up the fore-arm, and in every turn fold the bandage sharply and smoothly back upon itself, in such a way that it may lie smoothly on the limb.

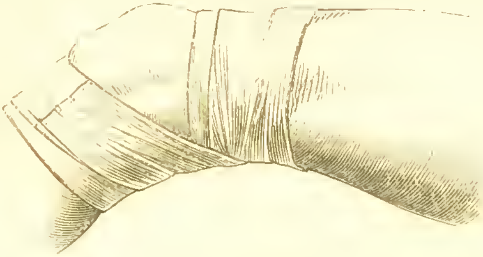


VIII. For the Foot.—Let the roller be first passed round the metatarsus, and then be carried up round the ankle, and back again round the foot exactly as depicted at page 75. The bandage should always be brought up on the inner side of the instep, as there shown, in order to support the arch of the foot.

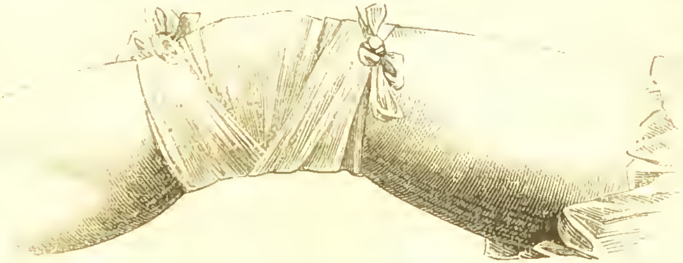


IX. For the Leg.—After the foot and ankle have been well enveloped let the bandage be carried up the leg, and be turned sharp on itself on the calf, in order that it may lie closely, and the folds not be separated.

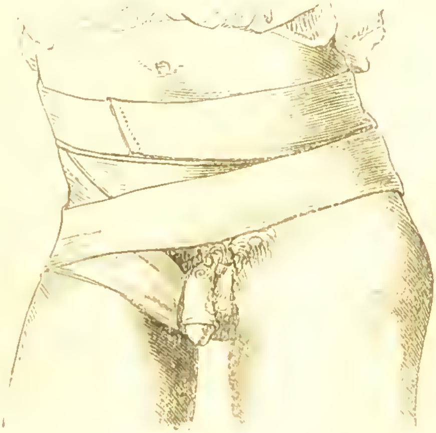
X. For the Knee.—To support the knee, in ordinary cases, a bandage may be passed round it in a figure of 8 form, excluding the patella. If that bone is to be covered, the bandage must be passed lightly over it afterwards several times, making turns when necessary to procure smoothness.



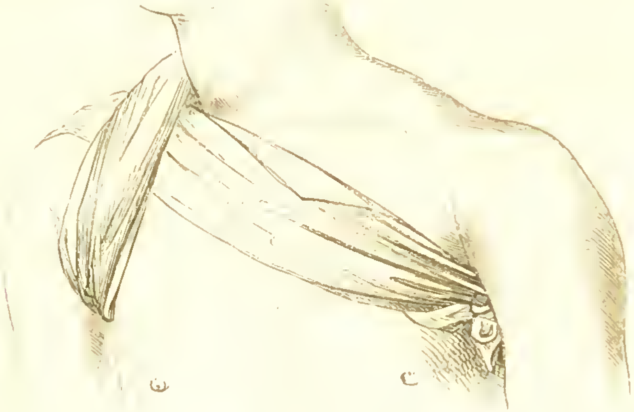
XI. Four-tailed Knee Bandage.—When it is merely wished to keep on dressings, or to give slight support, the four-tailed bandage may be used, as depicted and invented by that accomplished surgical artist, Dr. Westmacott. A piece of linen a yard and a half long, and eight or nine inches wide, is split up in the middle at each end to within a few inches of the centre. The centre being then placed on the patella, the four tails are brought under the knee, crossed, and tied two and two.



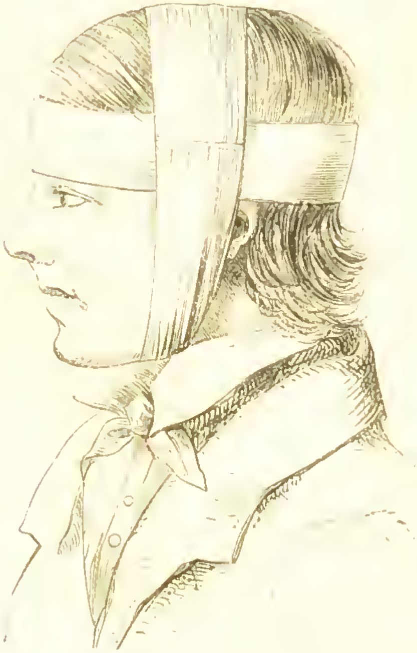
XII. For the Groin.—Having passed a roller round the lower part of the abdomen, and secured it with a stitch, bring it in front of the affected groin, then round the back of the thigh, next round the abdomen; and so on in a figure of 8 form, with the folds crossing each other over the groin.



XIII. For the Axilla.—In order to keep on dressings or poultices, &c., put the centre of a common handkerchief folded cornerwise under the axilla, cross it over the shoulder, and carry the ends one before, the other behind the chest, to tie under the opposite axilla.*



XIV. For the Head.—A roller having been carried horizontally round the forehead and occiput, and secured by a stitch, let it be carried vertically over the head and under the chin. At the point of crossing on either side let it be secured by a stitch.



XV. Four-tailed Head Bandage. — A four-tailed bandage having been prepared as directed for the patella, and the centre of it having been placed on the top of the head, inclining either to the front or the back as circumstances may require, two of the tails may be carried back round under the occiput, and be either tied there or be brought round the neck; and the other two be tied under the chin.

In bandaging the head care should always be taken to comb the hair so that it may lie smoothly and comfortably; and likewise to arrange the bandages so that the pressure may tell exactly where it is required.

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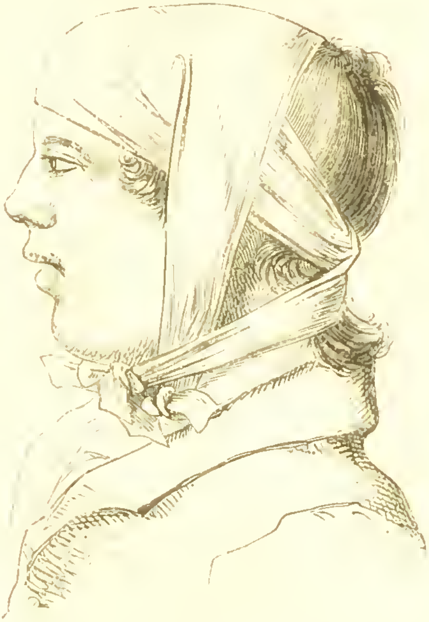
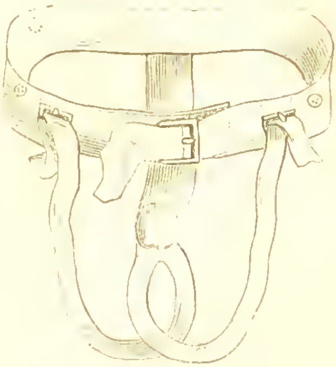
* Copied from Smith's Minor Surgery, Philadelphia, 1843.

The next figure will show what is meant.



XVI. Bandage for the Perinæum.—This consists of a circular girth for the loins; and of a piece that descends perpendicularly, and that is provided with a pad, covered with oiled silk, intended to press on the perinæum. The perpendicular piece is divided to enclose the scrotum or labia, and, lastly, is brought up in two portions to be attached to the circular girth in front. The circular girth may be kept up in its proper place by means of a pair of braces passing over the shoulders. This bandage is highly useful in prolapsus ani; and in prolapsus uteri from relaxation of the vagina; in which firm pressure on the perinæum gives the greatest possible comfort.

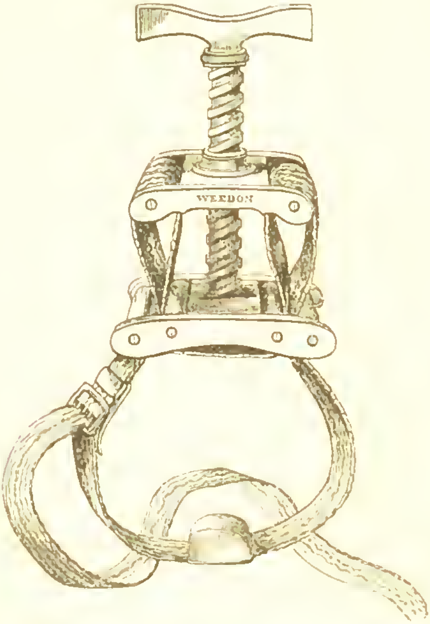


CHAPTER V.

OF THE AMPUTATIONS.

I. Amputation of the Thigh.—This amputation being probably the most important, and one that is very frequently practised, it will be convenient to describe it first; and to embody in the description of it such general precepts as are applicable to the other amputations.

In the first place, the surgeon should have his tourniquets, amputating knives, saws, forceps and tenacula, ligatures, bone-nippers, sponges, and curved needles threaded, close at hand on a tray, arranged in due order; and he should see with his own eyes that every requisite is at hand before he begins.



The next point is, to place the patient in a convenient posture. For amputation of the thigh, the patient may be placed on a bed, or on a table covered with a folded blanket; the diseased leg should project sufficiently over the edge, and should be supported at the knee by an assistant, who sits on a low stool in front; and the sound limb should be secured to one of the legs of the table with a handkerchief.

Then measures must be adopted for compressing the main artery, and preventing too great loss of blood. This may be done, either by pressure with the hand, or with the tourniquet. Pressure with the hand on the main arterial trunk, if effected by a steady assistant who can be trusted, is sufficient in most cases; and if the limb is amputated so high up that the tourniquet cannot be applied, there is of course no choice; the femoral artery must be compressed against the ramus of the pubes.

The common tourniquet consists of three parts; a pad, to compress the artery, which should be firm, narrow, and flattish; a strong band which is buckled round the limb; and a bridge-like contrivance, over which the band passes, with a screw, by turning which the bridge is raised and the band tightened. The pad should always be placed so as to compress the artery against the bone. The advantage of this instrument is, that it compresses the smaller arteries as well as the principal trunk; its disadvantage is, that it arrests the venous circulation, and causes a greater loss of venous blood; wherefore, it should never be constricted tightly until the incisions are just commencing.

This, like other amputations, may be performed in two ways—either by the *circular incision*—that is, by cutting round the limb from without towards the bone; or by the *flap operation*—that is, by transfixing the limb, and then cutting outwards. The flap operation is the favourite with the rising generation of surgeons; it certainly can be performed with much more facility; and it enables the surgeon to select a flap where he pleases, so that when the flesh on one side of the limb is destroyed by disease or injury, the end of the stump may be covered with a flap taken almost entirely from the sound side, and a greater length of limb may be preserved. It affords too a greater certainty of preserving a sufficiency of flesh to cover the bone; and it enables the muscles to be more easily retracted, and the bone exposed for the application of the saw. It entirely avoids the difficulty, also, which sometimes occurs in the circular operation, of retracting the skin when it has become adherent to the parts beneath. But, as Sir C. Bell observes, the grand rule in all cases is, to save integument enough to cover the muscle, and muscle enough to cover the bone, and not to scrape off the periosteum. And if these things are done, it requires ingenuity to make a bad stump.

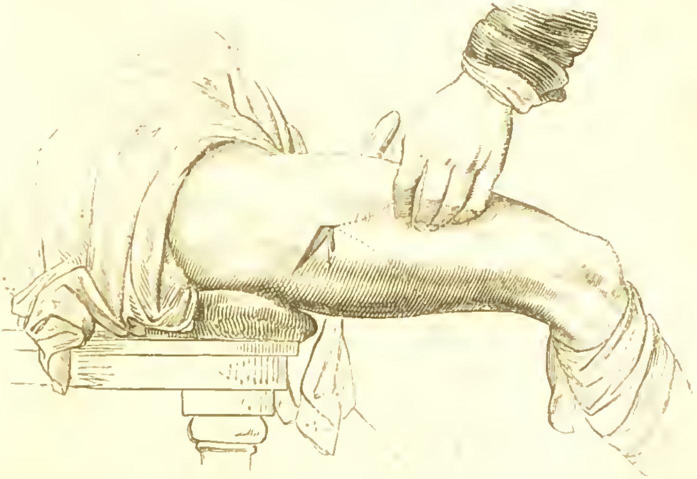
In this, as in all other operations, we suppose the patient to be under the influence of chloroform; unless there is some rare and special reason to the contrary.

1. *Circular Method.*—The surgeon stands on the outer side for the left leg, and on the inner for the right; so that he may use his left hand to grasp and steady the part which he is to amputate. The artery must be compressed by one of the methods before described, and an assistant must grasp the limb with both hands, so as to draw up the skin as high as possible. Then the surgeon commences by putting his arm under the thigh, and makes an incision at one sweep completely round the limb, through the skin and fat down to the

fascia. The assistant is now to draw the skin further up, the retraction being aided by a few touches with the knife; and then the knife, being put close to the edge of the retracted skin, is to be made to divide everything down to the bone by another clean circular sweep. The next thing is, to separate the muscles from the bone for another inch or two with the point of the knife, especially those connected with the *linea aspera;* and then the periosteum having been divided by one more sweep—the *retractor*, a piece of linen with a longitudinal slit in it, is put over the face of the stump, and the muscles are to be drawn up with it. Now the bone must be sawn through. The heel of the saw should first be put on the bone, and it should be drawn up so as to make a groove, before working it downwards; it should be used very lightly, and the last few strokes should be excessively short and gentle, that the bone may not be splintered. If it is, the irregular part must be removed by nippers. The femoral artery should now be tied, its orifice being seized and slightly drawn out by forceps; and afterwards any large branches that appear in the muscular interstices. Then all compression should be *suddenly ceased*, so that any arteries that are liable to bleed may do so, and be tied at once. Hæmorrhage from large veins is to be restrained by elevating the stump, and making compression for a short time with the finger. If, however, nothing else will do, they must be tied. Any obstinate oozing from small vessels, should be restrained by sponging with cold water, or perhaps by a touch with arg. nitras. Then a light bandage may be passed round the limb above the stump, and the edges of the wound should be approximated with a few strips of plaster, with or without sutures. The edges are to be brought together in a straight line, which may be made either perpendicular or horizontal, the latter however being probably the better plan. The ligature should be left hanging out in the interstices of the adhesive straps. The patient should then be removed to bed, and the stump be supported on a pillow covered with oil-cloth. No other application will be needed save a cloth dipped in cold water. Pain may be allayed by an opiate. The stump may remain as it is for some days, the discharge being merely wiped occasionally from its surface. But after from four to six days, sooner or later, according to the quantity of the discharge and the feelings of the patient, the dressings should be changed, the straps being taken off and replaced one by one, with care not to disturb the ligatures, and the hands of an assistant being employed to support the edges, and prevent their falling asunder. At the subsequent dressings, the points to be attended to are, to renew the light bandage occasionally, which was passed round the stump soon after the operation, in order to support the muscles, and prevent their retraction—to bring together the edges of the wound with adhesive straps — to remove the ligatures when loose — (that on the femoral artery should not be disturbed for a fortnight)—and to accelerate cicatrization by the nitrate of silver, or other stimulants, if the granulations appear languid.

There are a few varieties in the manner of performing this circular operation that require a brief notice. Some surgeons, after having cut through the skin, dissect it from the fascia, and turn it back—a proceeding necessary enough if this operation is performed (which it never should be) when the cellular tissue is condensed and adherent. Again, if the patient is *very emaciated*, the circular incision may be carried down to the bone at once without ceremony, because in such patients the muscles always retract greatly. Sir C. Bell recommends the skin not to be divided quite circularly, but the knife to be inclined a little, first to one side then to the other, so as to make two oval flaps. The same may be done also in dividing the muscles. He further recommends that the limb should be raised perpendicularly whilst the bone is being sawn, so that the saw may be worked horizontally, by which means, he says, the bone may be divided more evenly, and much shorter, so that its end will be no more seen when the stump is depressed.

2. *Flap Operation.* — The flaps may be made, either from the inner and outer, or from the anterior and posterior aspects of the limb. The latter way is the most convenient if the amputation is low down; but the former, if it is in the middle or upper third; because the end of the bone is liable to be tilted forwards by the iliacus and psoas muscles, and to project between the lips of the wound. In performing this operation, the surgeon, standing as before,* grasps the flesh on the anterior surface of the limb with his left hand, and lifts it from the bone; then passes his knife horizontally through it—carries the



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[*] Mr. Fergusson thinks it more convenient that the surgeon should stand on the outer side in amputating the right thigh, as it is awkward to stoop over the sound limb; which, moreover, is in the way of the surgeon's hand.

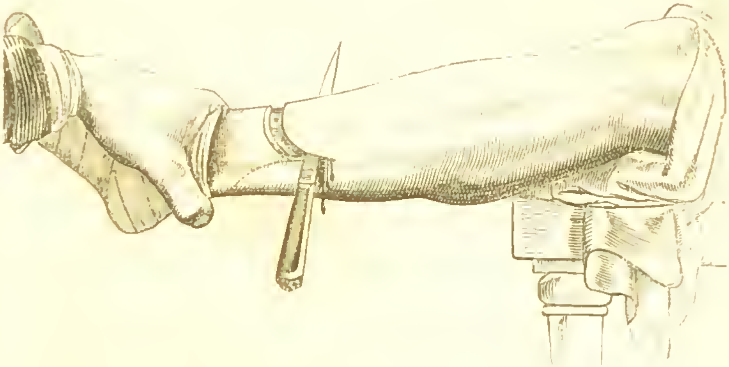
point over the bone, pushes it through the other side of the limb, as low as possible; then makes it cut its way out upwards and forwards, so as to make the anterior flap. In amputating the right leg, the knife should be passed in behind the saphena vein. It is again entered on the inner side a little below the top of the first incision, passed behind the bone, brought out at the wound on the outside, and directed so as to make a posterior flap in the direction of the dotted line. This should be a very little longer than the anterior, because the flexor muscles retract more than the extensors which are adherent to the bone. Both flaps are now drawn back; the knife is swept round the bone to divide any remaining muscular fibres, and the bone is sawn through. In the same manner flaps may be made from the inner and outer sides of the limb, the surgeon first grasping the flesh, and transfixing it, and cutting a flap on one side of the bone, then passing the knife close to the bone on the other side (without again piercing the skin), and making another flap.

II. AMPUTATION AT THE HIP-JOINT was performed by Mr. Liston after precisely the same manner in which he amputated the thigh. The femoral artery being compressed, the knife was entered about midway between the anterior superior spinous process of the ilium and the trochanter; and was carried across the front of the articulation, so as to form the anterior flap. Then the anterior part of the capsular ligament having been cut into, and the *ligamentum teres* and posterior part of the capsular ligament divided, the blade of the knife was put behind the neck and trochanters of the femur, and the posterior flap was formed. The vessels on the posterior flap were tied first. But this method can hardly be preferable to that of making two lateral flaps; first, passing the knife completely through the limb on the inner side of the joint, and carrying it forwards and inwards, so as to form a flap of the adductor muscles; then cutting into the joint, and severing the *ligamentum teres*, and the muscles attached to the digital fossa with a short strong curved knife; and lastly, putting in the knife over the trochanter, and cutting downwards and outwards, so as to make the external flap. In this manner Mr. Mayo performed this operation in less than half a minute. He previously tied the femoral artery below Poupart's ligament; but most authorities prefer compressing it during the operation, and tying its cut orifice afterwards.

III. AMPUTATION OF THE LEG.—The rule generally given is, that this operation should be performed as near the knee as possible, unless the patient can afford an artificial foot; because a labouring man would find it very inconvenient to have a long stump trailing after him; as it would if he rested on the bent knee with the ordinary wooden leg. But a wooden leg may be procured, which is light and inexpensive, and which enables the patient to rest on the stump and to have the use of the knee; and therefore it is better not to sacrifice more of the limb than can be avoided.

1. *Circular Method.*—The artery being under command, as in amputations of the thigh, and the leg being placed horizontally, one

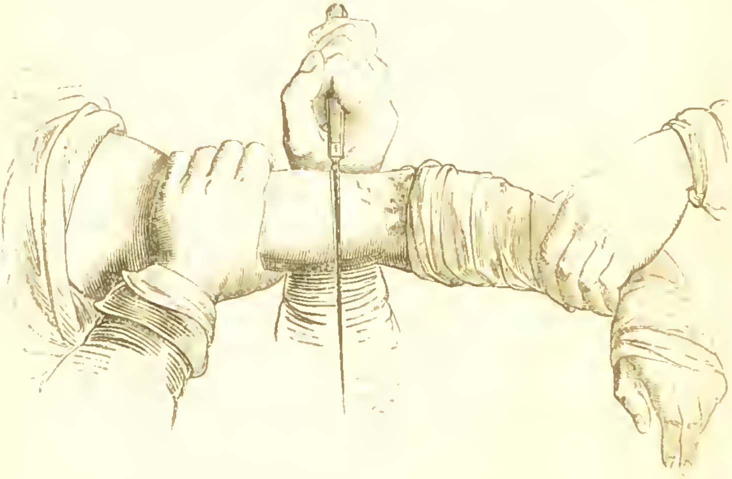
assistant supporting it at the ankle, and another holding it at the knee and drawing up the skin, the surgeon (standing on the inner side for the right leg, and *vice versâ*) makes a circular incision through the skin, four inches below the tuberosity of the tibia. The integuments are next to be dissected up for two inches, and turned back; and the muscles are to be divided down to the bone by a second circular incision. Then a long slender double-edged knife, called a catline, is passed between the bones to divide the interosseous ligament and muscles, and both bones are sawn through together, the flesh being protected by a retractor, which should have three tails. The spine of the tibia, if it projects much, may be removed with a fine saw or bone nippers, and care should be taken not to leave the fibula longer than the tibia, or it will give much trouble. The anterior and posterior tibial and peronæal arteries, and any others requiring it, being tied, the stump is to be treated as directed after amputation of the thigh. The integuments should be put together, so as to make a perpendicular line of junction.



2. But it is agreed on all sides that the flap operation is by far the best for this situation, and the easiest way of performing it is as follows:—The surgeon passes his knife horizontally behind both bones at the level of an inch below the head of the fibula, and cuts downwards and forwards, so as to make a flap of the posterior muscles about four or five inches long. A semi-lunar incision, with the convexity downwards, is then made across the front of the limb, the skin is slightly turned back, the parts between the bones are divided, and the bones are sawn as before. But the manner in which Mr. Fergusson performs this amputation renders it by far the most elegant and expeditious operation which the author ever witnessed. He first places the heel of the knife on the side of the limb farthest from him, and draws it across the front of the limb, cutting a semi-lunar flap of skin; when its point has arrived at the opposite side, it is at once

made to transfix the limb; this stage of the operation is represented in the preceding cut; and then the flap is cut, as above directed. When transfixing the right limb, the surgeon must take great care not to get his knife between the two bones. When the operation is performed high up, the popliteal artery will be divided instead of the two tibials. The tibia, however, should never be sawn higher than its tuberosity, or the joint will be laid open. The amputation may be performed near the ankle in the same manner. If low down, the *tendo Achillis* will require to be shortened after the flap is made. The flap is to be brought forwards, and confined by a stitch or two, the line of junction being of course horizontal.

IV. AMPUTATION OF THE ARM.— In amputation of the upper extremity, the flow of blood may be sufficiently commanded by compressing the artery above the clavicle, or in the arm. If it is thought proper, however, the tourniquet may be applied so as to compress the artery against the humerus.



1. *Circular.*—The arm being held out, and an assistant drawing up the skin, one circular incision is made through the skin, which being forcibly retracted, another is made down to the bone. These incisions should be made with two slight divergences, so as to cut the skin and muscles rather longer in front and behind than at the sides. The subsequent steps are precisely similar to those in amputating the thigh.

2. *Flaps.*—The knife is entered at one side, carried down to the bone, turned over it, brought out at a point opposite (the vessels being left behind for the second flap), and then made to cut a neat rounded anterior flap two or three inches long. It is next carried behind the bone, to make a posterior one of equal length; and is

lastly swept round the bone, to divide any remaining fibres. The division of the bone, ligature of the arteries, and treatment of the stump as before.

V. AMPUTATION AT THE SHOULDER may be performed in several manners. 1. The patient being seated in a chair and well supported, or, which is better, being placed on a firm table, with the shoulder elevated, and projecting beyond its edge, and the subclavian artery being compressed, the surgeon enters a long straight knife at the anterior margin of the deltoid muscle, an inch below the acromion. From this point, he thrusts it through the muscle, across the outside of the joint, and brings out the knife at the posterior margin of the axilla. If the left side is operated on, the knife must be entered at the posterior margin of the axilla, and be brought out at the anterior margin of the deltoid muscle. Then, by cutting downwards and outwards, the external flap is made. The origins of the biceps and triceps, and insertions of the infra and supra spinatus, are next cut through, and the joint is laid open. Finally, the blade of the knife, being placed on the inner side of the head of the bone, must be made to cut the inner flap.

2. The covering for the exposed part of the scapula, in the preceding operation, was obtained from the deltoid. But it may also be obtained from the muscles in front or behind, supposing the deltoid to be implicated in the disease or injury which demands the operation. One elliptical incision may be carried from beneath the middle of the acromion to the posterior border of the axilla, and another to the anterior border. These flaps being dissected up, the head of the bone may be turned out of the socket, and the remaining soft parts be divided; or the bone may be sawn through just beneath its neck. An assistant should be directed to grasp the flap which contains the axillary artery as soon as it is divided; because the pressure above the clavicle is generally not sufficient to stop the circulation.

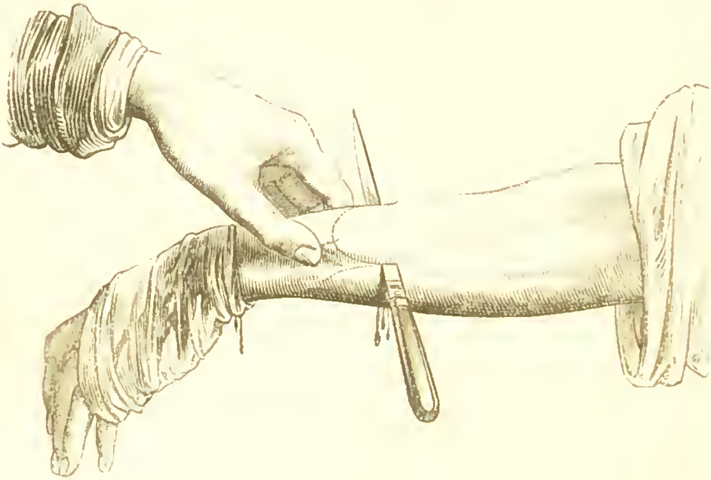
VI. AMPUTATION AT THE ELBOW is performed by passing the knife through the muscles in front of the joint, and cutting upwards and forwards, so as to make a flap of them. Then the operator (who stands on the inner side for the right arm, and *vice versâ*) makes a transverse incision behind the joint. He next cuts through the external lateral ligament, and enters the joint between the head of the radius and external condyle, then divides the internal lateral ligament, and, lastly, saws through the olecranon, the apex of which, with the triceps attached to it, is of course left in the stump.

VII. AMPUTATION OF THE FORE-ARM should always be performed as near the wrist as possible.

1. *Circular.*—The limb being supported with the thumb uppermost, and an assistant drawing up the skin, a circular incision is made through it down to the fascia. When the skin has again been retracted as much as possible, the muscles are divided by a second circular incision; the interosseous parts and the remaining fibres are next cut through with a catline; the flesh is drawn up with a three-

tailed retractor, one tail of which is put between the bones, and the bones are then to be sawn through together, the saw being worked perpendicularly. The radial, ulnar, and two interosseous arteries require ligature.

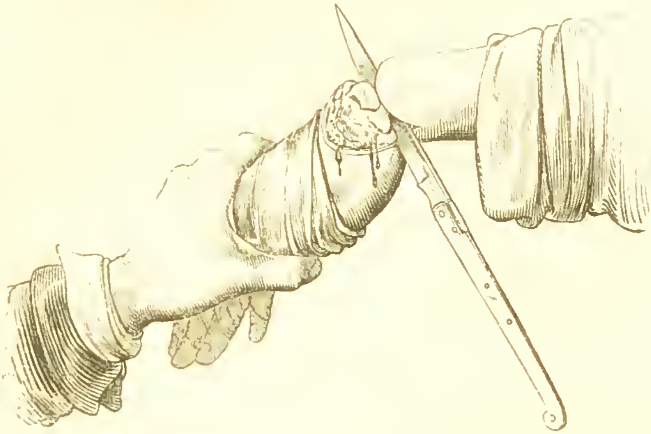
2. *Flaps.*—The limb being placed in a state of pronation, the surgeon makes a flap from the extensor side, just as is represented in the next cut; and he then transfixes the flexor side, and makes the other flap; taking care not to pass the knife between the bones, whilst performing either transfixion. The interosseous parts are next divided, the flesh drawn upwards, and the bones sawn through. If the tendons project, they must be shortened.



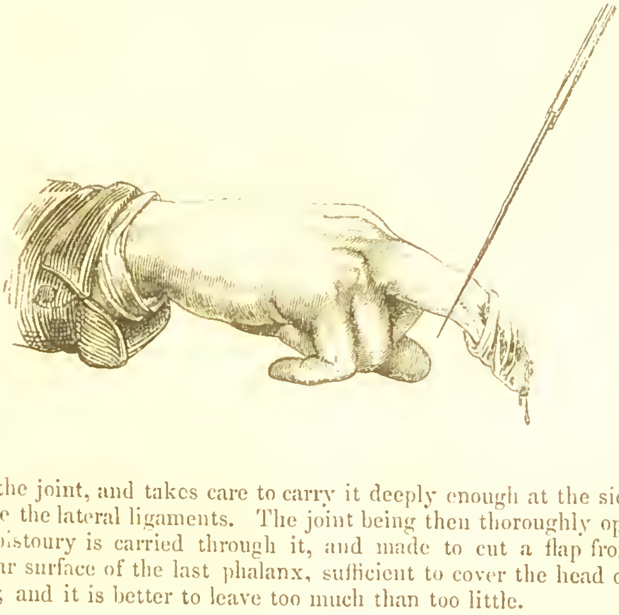
VIII. AMPUTATION OF THE WRIST. — 1. *Circular.* — The skin being pulled back, a circular incision is made a little below the level of the line that separates the fore-arm from the palm of the hand. The external lateral ligament is then cut through, and the knife carried across the joint, to divide the remaining attachments.

2. *Flaps.*—A semi-lunar incision is made across the back of the wrist, its extremities being at the styloid processes, and its centre reaching down as far as the second row of carpal bones. This flap being dissected up, the joint is opened behind, the lateral ligaments are cut through, and the knife, being placed between the carpus and bones of the fore-arm, is made to cut out a flap from the anterior surface of the palm as represented in the next figure.

This operation is scarcely to be preferred to amputation of the fore-arm low down, as the flaps with their numerous tendons may not unite readily, and there may be a difficulty in preserving flesh enough to cover the ends of the bones.



IX. AMPUTATIONS OF THE HAND.—1. Amputation of the *fingers or thumb at their last joint* may be performed thus: The surgeon holds the phalanx firmly between his finger and thumb, and bends it, so as to give prominence to the head of the middle phalanx. He then makes a straight incision across the head of the middle phalanx, so as to cut into the joint, and takes care to carry it deeply enough at the sides to divide the lateral ligaments. The joint being then thoroughly opened, the bistoury is carried through it, and made to cut a flap from the palmar surface of the last phalanx, sufficient to cover the head of the bone; and it is better to leave too much than too little.



If, however, the joint cannot be bent, this operation may be performed thus: The surgeon holding the phalanx firmly, with its palmar surface upwards, first passes his knife horizontally across the front of the joint, the flat surface towards it, and cuts out the anterior flap; then divides the lateral ligaments and the remaining attachments with one sweep of the knife.

2. Amputation at the *second joint* of the fingers or thumb may be performed in the same manner.

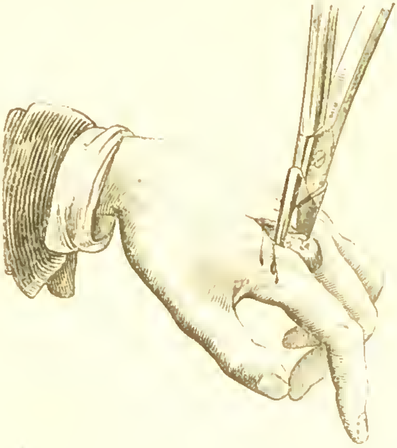
3. It is always expedient to save as much as possible of the forefinger and thumb; consequently, in cases admitting of it, a flap may be made from the soft parts in front; those behind may be divided by a semilunar incision, and then the bone may be sawn through, or be cut with bone nippers.

4. Amputation of a *finger at the metacarpal joint* may be effected by making a semilunar incision on one side of the prominence of the knuckle, from a quarter of an inch beyond the joint, to the middle of the digital commissure on the other side of it. The finger being then drawn to the other side, the extensor tendon is cut through, and the point of the bistoury is passed into the joint, and made to divide its ligaments. This will allow the head of the bone to be turned out, so that the bistoury being placed behind it may cut through the remaining attachments and make another flap. This operation may also be performed by making an incision on one side of the joint (as in the method just described), and then bringing it across the palmar surface, and round the other side, to terminate where it began. The tendons and ligaments are now to be divided, and the head of the bone turned out. The digital arteries must be tied, and after bleeding has ceased, the wound may be closed by confining the adjoining fingers together. It must be recollected, that the situation of this joint is full half an inch above the lines that divide the fingers from the palm.

5. Amputation of the *metacarpal bone of the thumb* is performed thus: The thumb being separated from the fingers, an incision must be carried from the centre of the commissure between it and the forefinger, down to the articulation with the trapezium. The incision should be inclined rather towards the metacarpal bone of the thumb. The thumb being then forcibly abducted, the blade of the bistoury is to be carried through the joint (which, it must be recollected, lies obliquely in a line extending to the root of the little finger); the head of the bone is to be forcibly dislocated towards the palm; the knife is then made to cut its way out, so as to form a flap of the skin and muscles which constitute the ball of the thumb.

When the metacarpal bone of the thumb alone is diseased, it should, as Mr. Fergusson advises, be extirpated alone, and its phalanges should be preserved. The bone should be exposed by means of an incision along its radial margin; then its articulation with the phalanges should be divided; and lastly, it may be turned out and separated from the trapezium; taking care not to wound the radial artery where it passes between the first and second metacarpal bones.

6. Amputation of the *metacarpal bone of the little finger*, at the joint between it and the unciform, is performed thus: The flesh and the integuments being grasped, and drawn away from the ulnar side of the bone, a bistoury is passed perpendicularly through them close to the joint, and made to cut its way downwards to a little beyond the articulation with the first phalanx. The skin of the hand being next strongly drawn towards the thumb side, the bistoury is placed on the other side of the bone (without again piercing the skin), and carried along so as to divide everything down to the digital commissure. Then the ligaments of the joint are to be divided, first on the inner, and next on the dorsal aspect. It is, however, a much better plan, if it can be effected, to cut through the bone by means of the saw or bone-nippers, than to remove it at the articulation.



7. Amputation of the *head of a metacarpal bone* is effected by making an incision on each side of it (as in amputation of the fingers at the joint, but extending rather higher up), and then cutting through the bone with the cutting-forceps. Mr. Fergusson recommends the head of the metacarpal bone to be removed in almost every instance where the entire finger is abstracted, because the deformity is much less. But the part need not be removed high enough up to divide the transverse ligament. Care must be taken during the cure, to keep the fingers parallel, and prevent them from crossing at their tips.

If a part or the whole of the shaft of one of these bones is to be removed also, an incision should be made along its dorsum, to the point where the two former ones meet; and then the flesh being dissected away on either side, the bone may be cut through or disarticulated according to circumstances.

X. Amputations of the Foot.—1. Amputation of the *toes* at any of their joints is performed in precisely the same manner as amputation of the fingers. In removing a single toe from its metatarsal bone, the surgeon should take care first of all to ascertain the exact situation of the joint, which lies rather deeply. Moreover he should not remove the head of the metatarsal bone, as he may of the metacarpal, because it is important to preserve the entire breadth of the foot.

2. Amputation of *all the toes at their metatarsal joints*—an operation which may be requisite in cases of frost-bite—is performed by

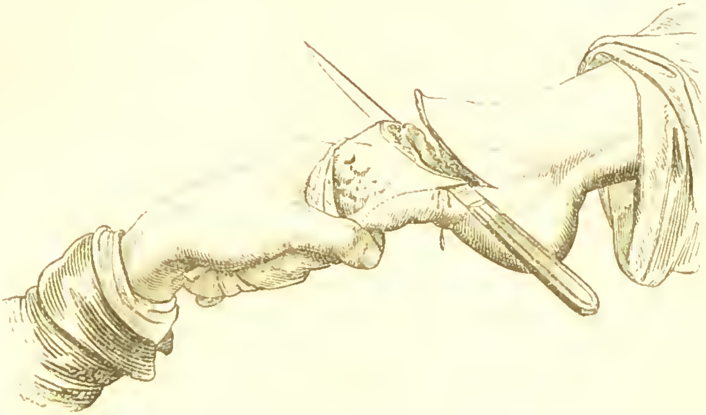
first making a transverse incision along the dorsal aspect of the metatarsal bones, dividing the tendons and lateral ligaments of each joint in succession; and then, the phalanges being dislocated upwards, the knife is placed beneath their metatarsal extremities, and made to cut out a flap from the skin on the plantar surface, sufficient to cover the heads of the metatarsal bones. The arteries are to be tied, and the foot laid on its outer side, so that the discharge may escape more readily.

3. Amputation of the *metatarsal bone of the great toe* is performed precisely like the operation for the removal of the metacarpal bone of the little finger. It is better, if circumstances permit, to cut through the bone, than to disarticulate it from the internal cuneiform bone, and it may be observed that, in dividing the metatarsal bones of the great or little toes, or the metacarpal bones of the fore or little finger, the forceps should be held obliquely, so as not to leave any prominent angle.

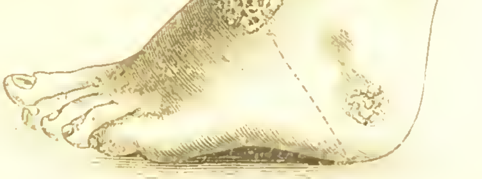
4. Amputation of *all the metatarsal bones* is performed in the following manner: The exact situation of the articulation of the great toe to the inner cuneiform bone (to which the tendon of the tibialis anticus may serve as a guide) being ascertained, a semi-lunar incision, with the convexity forwards, is made down to the bone, across the instep, from a point just in front of it, to the outside of the tuberosity of the fifth metatarsal bone. The flap of skin thus formed being turned back, the bistoury is to be passed round behind the projection of the fifth metatarsal bone, so as to divide the external ligaments which connect it with the cuboid. The dorsal ligaments are next to be cut through, and then the remaining ones, the bone being depressed. The fourth and third metatarsal bones are to be disarticulated in a similar manner, dividing their ligaments with the point of the knife, and taking care not to let the instrument become locked between the bones. The first metatarsal is next to be attacked, and lastly the second, the extremity of which, being locked in between the three cuneiform, will be more difficult to dislodge. Perhaps it may be convenient to saw it across. When all the five bones are detached, the surgeon completes the division of their plantar ligaments, and slightly separates the textures which adhere to their under surface with the point of the knife, and then, the foot being placed horizontally, he puts the blade under the five bones, and carries it forwards along their inferior surface, so as to form a flap from the sole of the foot sufficient to cover the denuded tarsal bones. The flap should be about two inches wide on the inner side and one on the outer.

5. Amputation may be performed *through the tarsus*, so as to remove the navicular and cuboid bones, with all the parts in front of them. This is commonly called *Chopart's operation*. In the first place, the articulation of the cuboid with the os calcis (which lies about midway between the external malleolus and the tuberosity of the fifth metatarsal bone), and that of the navicular with the astragalus—(which will be found just behind the prominence of the navicular bone

in front of the inner ankle)—must be sought for, and a semilunar incision be made from one to the other, as in the last described operation. The flap of skin being turned back, the internal and dorsal ligaments that connect the navicular to the astragalus, are to be divided with the point of the bistoury, recollecting the convex shape of the head of the latter bone. The ligaments connecting the os calcis and cuboid are next divided, and lastly, a flap is to be procured from the sole of the foot, as in the last operation.



XI. AMPUTATION AT THE ANKLE-JOINT.—*Syme's Operation.*—This operation is proposed by Mr. Syme to be substituted for amputation above the ankle in cases in which disease or injury of the tarsus implicates the astragalus and os calcis, and for which, therefore, Chopart's operation is inadmissible. The principle of the operation is,



that the whole of the bones of the foot are taken away; that the articular surface of the tibia and both malleoli are cut off smoothly; but that the skin of the heel is preserved, as the best and most natural cushion for the stump to rest upon. Mr. Syme makes one curved incision across the instep from one malleolus to the other; and carries a second across the sole of the foot. The flaps are dissected from the subjacent parts, which is easily effected except just at the heel; the astragalus and os calcis, with the rest of the foot, are removed, and the projections of the malleolar processes cut off with forceps. If the ankle-joint itself is diseased, a thin slice of the lower extremities of the tibia and fibula may be removed with a saw. The thick skin of the heel is then brought up to cover the ends of the bones, and is retained by sutures. It appears useful sometimes to make a puncture through the integuments of the heel, to let the discharge escape freely. Mr. Fergusson, finding that the skin left is more than required, and that it is apt to slough, carries his incision in the line represented in the preceding figure, so as to abridge the lower flap.*

Wakley's Operation.—The principle is a good one, that no more of the body should be removed than is absolutely requisite for the removal of disease, and guided by this principle, Mr. T. Wakley in one case of diseased ankle-joint, removed the diseased bones only, that is, the os calcis, astragalus, and malleolar processes of the tibia and fibula, with a small portion of the integuments of the heel, without removing the rest of the foot, as in Syme's operation. Further experience is required before it can be stated whether the anterior part of the foot thus preserved, will be of much use; but at all events the theory of sacrificing no part of the body that can be saved, is a sound one.†

STUMPS, *Affections of.*—1. *Secondary hæmorrhage* may occur under the same circumstances as after other wounds, and requires no observations distinct from those made at pages 127 and 300.

2. *Erysipelas* and *phlebitis* have also been fully treated of elsewhere; one of them may be suspected to be coming on if the patient, a few days after amputation, is seized with a violent shivering.

3. It sometimes happens that the flesh shrinks away from the end of the bone, which becomes white and dry, and finally exfoliates. The nitric acid lotion is the best application.

4. *Protrusion of the bone* is a very awkward circumstance. It not only greatly retards the healing of the stump, but the cicatrix when formed is thin, red, constantly liable to ulcerate, and unable to bear the least pressure or friction. The cause of the *conical stump*, as it is technically called, is generally a want of skin and muscle sufficient to cover the end of the bone. Sometimes, however, it arises from spasmodic retraction of the muscles, especially if they have not been properly supported by bandages during the cure. The remedy is simple; the bone must be shortened. This may be done in slight cases by

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* Lancet, 1850, vol. i. p. 217.

† For a report, drawings, &c. vide Lancet, 1848. vol. ii. p. 5.

making a longitudinal incision over the bone on the side opposite the vessels, and sawing off a sufficient portion of it, removing at the same time any diseased portion of the cicatrix. But if the projection is considerable, the entire end of the stump must be amputated.

5. *Neuralgia* of the stump is another very untoward event. It sometimes arises, because the truncated extremities of the nerves (which after amputation always swell and become bulbous) adhere to the cicatrix, so as to be subject to constant compression and tension. Sometimes, however, it is entirely independent of any morbid state of the extremities of the nerves, but arises from some irritation in their course, or from some irritation, centric or excentric, of the spinal cord. Sometimes, again, no local cause whatever is detectable; and the pain is evidently connected with an hysterical state of the system. In any case the symptoms are extreme irritability and tenderness, paroxysms of violent neuralgic pain, and spasms and twitchings of the muscles, which not unfrequently retract, and cause the bone to protrude, and the stump to become conical.

Treatment.—1. Gentle friction with strong mercurial ointment, to which a little powdered camphor, or extract of belladonna may be advantageously added; or Scott's ointment, F. 160, spread on lint, and worn as a plaster, or the emplastrum saponis or plumbi, combined with a little belladonna or opium, together with change of air, and the administration of remedies calculated to restore the strength, maintain the secretions, and allay irritability, such as sarsaparilla with henbane; steel in various forms; and aloetic pills with galbanum, sometimes suffice to remove the extreme sensitiveness of these as well as of other irregular cicatrices. 2. If the pain and tenderness are referred to one or two nerves only, their bulbous extremities should be cut down upon and removed. 3. If, however, the whole surface of the stump is implicated, or if the bone protrudes, a second amputation should be resorted to. But in the case of young hysterical women, the propriety of a second operation is extremely doubtful. The cases on record in which this practice was adopted, present no satisfactory results; the pain was removed for a time, but returned when the wound healed. It can therefore be justifiable only when performed at the patient's urgent request, after every local and general remedy likely to be of service has been tried perseveringly, but in vain.

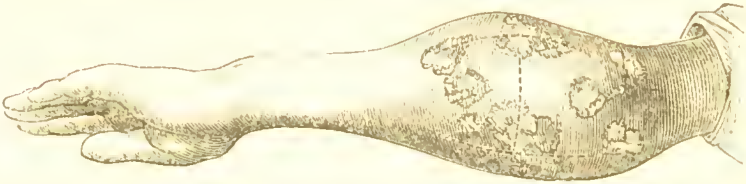
CHAPTER V.

EXCISION OF JOINTS.

In certain cases of chronic disease, or gun-shot injuries, or other violent crushing fractures of joints, an attempt may be made to save the limb, by cutting out the joint, instead of performing amputation.

This operation has now been performed on most of the joints; and the results cannot be stated better than in the words of Mr. Blackburn, who says, "that excision is advisable in the shoulder and elbow; that it is admissible, though of doubtful utility, in the ankle; and that it is inadmissible, except under very peculiar circumstances, in the wrist, hip, and knee." *

I. Excision of the Elbow-joint is effected in the following manner. The patient is placed on a table; the limb is held out and well supported. The joint is laid open by cutting through the coverings of its dorsal aspect. If the disease is not very extensive, it will be sufficient to make a crucial incision—a perpendicular cut three or four inches long, and a transverse one at the level of the interval between the external condyle and head of the radius. If the disease is more extensive, an H incision should be made, so that two flaps can be turned up. The ulnar nerve should be carefully preserved, and held aside; the insertion of the triceps should be divided, and then, says Mr. Liston, "the ends of the bones, but slightly retained by their ligaments, are turned out of the wound by flexing the fore-arm; the soft parts are detached, as much as is necessary, by cutting upon and close to the bones; the extent of ulceration or necrosis is then well ascertained, and by the application of the saw the unsound parts may be removed." A copper spatula may be used to protect the nerve and soft parts whilst the bones are sawed. The cutting bone forceps may be substituted for the saw with young patients; and Mr. Fergusson recommends the gouge to be used for the purpose of scooping away small spots of the carious bone, which cannot be removed by either forceps or saw. Any arteries that require it having been tied, the wound is closed by two or three sutures and slips of plaster; and placed half-bent on a pillow. The ends of the bones will unite by ligament, and in many cases a very useful degree of motion will be acquired.



II. The Shoulder-Joint may be exposed by making a perpendicular incision through the deltoid, three or four inches downwards from the acromion; and another from the extremity of the first incision upwards and backwards to the posterior border of the deltoid. The triangular flap, thus formed, is reflected upwards and backwards; the joint may be laid open; the head of the humerus be exposed and

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* Guy's Hosp. Rep., vol. i.

turned out, and sawn off; and the glenoid cavity of the scapula, if diseased, may be removed by the bone nippers or gouge. But as this operation is most frequently required in cases of gun-shot wound, the surgeon may vary his incisions, according to the extent and situation of the wound; and may make them of a V or T shape, or may make a simple curved flap, by cutting from near the coracoid process to an inch behind and below the root of the acromion.

Extirpation of the clavicle, as it was performed by Mr. Travers, has been mentioned under the head of tumours of bone, p. 224. The entire *scapula* was removed by Mr. W. Fergusson from a patient in the King's College Hospital in February 1847. The arm had previously been removed at the shoulder-joint, and a portion of the glenoid cavity and adjacent bone with it. The patient made a good recovery.*

III. THE KNEE-JOINT has been occasionally excised during the last century, with the hope of preserving a useful limb, after the removal of the diseased joint. The operation was first performed in 1762 by Mr. Filken, of Northwich, in Cheshire; it was subsequently performed twice by Mr. Park of Liverpool, once by Moreau, and Mülder of Groningen, twice by Sir Philip Crampton, and twice by Mr. Syme. One of Mr. Park's cases was eminently successful, so was one of Crampton's and of Syme's. Park's patient, who was a sailor, was able to go aloft, and perform the usual duties of his calling.†

Acting upon the praiseworthy idea, that no part of the human body should be abstracted, if it can be preserved with safety, and is capable if preserved, of being useful, Mr. Fergusson performed this operation in the King's College Hospital in July 1850. An H shaped incision was made in front of the limb, composed of two perpendicular incisions on either side, about four inches long, joined by a transverse one just below the patella. The ligamentum patellæ being severed, and that bone turned up, the front of the joint was laid open, the connections of the bones severed, and the ends of the femur, tibia, and fibula, with the patella were removed. This patient unfortunately perished of acute necrosis of the femur; an accident which would in all probability have proved equally fatal if the limb had been amputated.‡

These operations must of course be well considered before they are set about. They must neither be performed unnecessarily, in cases that might get well with proper local and constitutional treatment; nor, on the other hand, should they be resorted to when the constitution has become exhausted, and the limb disorganised by long suppuration; nor yet in cases of injury so complicated, that the patient would be liable to sink from the ensuing irritation and discharge.§

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* Med. Chir. Trans., vol. xxxi.

† Vide S. Cooper's Surgical Dict., *Art.* Joints.

‡ Medical Times, August 31, 1850.

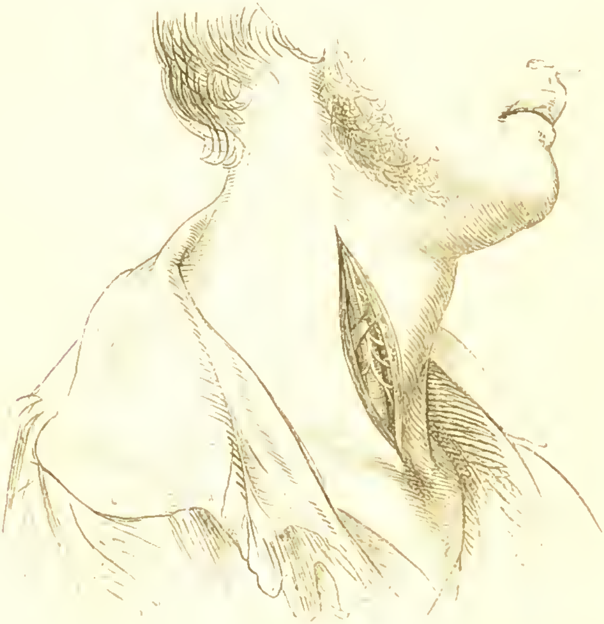
§ For every further information concerning amputations, and excisions of joints, the author must refer his readers to Mr. Fergusson's Practical Surgery, to Mr. Liston's works, and to Malgaigne's Manuel de Médecine Opératoire, translated by Mr. Brittan.

CHAPTER VI.

OF THE LIGATURE OF ARTERIES.

It may be as well to remind the reader, that when an artery is wounded, the wounded part should always, if possible, be exposed, and a ligature be placed both above and below it. If the wound in the superjacent parts pass directly to the vessel, it may be enlarged in the proper direction and to the requisite extent. If, however, the wound pass indirectly (from the back of the thigh, for instance, to the femoral artery), the part of the vessel supposed to be wounded should be cut down upon in the ordinary way. In both cases the introduction of a probe will be a useful guide to the seat of injury. If the wounded part of the artery cannot be tied, a ligature must be placed on the main trunk above, at the nearest practicable point; and perhaps it may be expedient to place another below to prevent regurgitation.

I. The Common Carotid Artery is generally tied below the spot where it is crossed by the omo-hyoideus muscle. The patient



being placed on his back, with the shoulders raised, and with the head thrown back and slightly turned towards the opposite side, an incision three inches in length is made along the inner margin of the sterno-mastoid muscle. This incision should be carried through skin, platysma, and superficial fascia, and should terminate about an inch above the sternum. The head should now be brought a little forwards, so as to relax the sterno-mastoid muscle, and the cellular tissue beneath is to be raised with forceps and divided; but any veins that are found are to be turned aside with the handle of the scalpel, and are not to be wounded if it can be avoided. Next come the thin strong deep fascia and the omo-hyoideus muscle, to the margins of which it adheres. It should be pinched up slightly with the forceps, just below that muscle, and be divided by cautious touches with the knife, which should be held with its flat surface towards the artery; and this division of the fascia should be made immediately over the artery, the situation of which is to be carefully ascertained with the finger. Then about half an inch of the sheath is to be opened in the same manner, avoiding the descendens noni nerve, which ramifies upon it. It should be opened rather to the inner side of the artery, so that the jugular vein may not be interfered with. Then an aneurism needle, armed with a single ligature, is to be carried round the vessel. It is to be passed from the outer side, and to be kept close to the vessel, within its sheath. When its point appears on the inner side, the surgeon seizes the ligature with forceps, and withdraws the needle; ascertains that the nervus vagus is not included in the ligature, and then ties it tightly in the double knot represented at page 297. One end of the ligature may then be cut off close to the knot, and the other be left hanging out of the wound, which is to be closed with plaster when bleeding has ceased. The patient must be kept at perfect rest in bed till the ligature separates.

This artery may also be tied above the omo-hyoideus, by making an incision through the skin and platysma three inches in length, and terminating at the level of the cricoid cartilage. The fascia should next be divided on a director, in the same manner as the layers over a hernial sac (p. 485). The surgeon then separates the cellular tissue and veins from the sheath, and opens the sheath and passes the ligature in the manner described above.

II. THE EXTERNAL CAROTID may if wounded require a ligature; or if many of its branches are wounded, *and cannot be tied;* but such an operation is very rarely, if ever, practised. An incision of the same length and direction as in the two preceding operations should be made through the skin, platysma, and sheath, so as to tie the vessel near its origin, that is, at the level of the os hyoides, and below the part where it is crossed by the digastric muscle and ninth nerve.

THE INTERNAL CAROTID is sometimes wounded by gashes, stabs, or shot from without, or by punctures from within, as may happen when a person falls down with a tobacco-pipe in his mouth, and drives it through the back of the pharynx. In such cases, ligature of the common carotid is a very uncertain remedy, and Mr. Guthrie proposes (in compliance with the rule of always securing a wounded artery by two ligatures, one above and one below the wounded part) to reach the wounded vessel by operation. The leading feature of this operation is, the removal of the second molar tooth, and division of the lower jaw-bone, so that the angle of that bone may be everted, and room be given for reaching the vessel. Mr. Mayo once tied this artery, and in order to reach it cut through the styloid process of the temporal bone.*

III. The Lingual Artery may be tied by making a transverse incision along the os hyoides, from a little below the symphysis of the jaw to near the border of the sterno-mastoid muscle. The skin, platysma, and fascia being divided, the artery must be looked for where it lies upon the greater cornu of the os hyoides, below the digastric muscle and ninth nerve. This artery has been tied in cases of tumours and wounds of the tongue; but, considering the depth at which it lies from the surface, the irregularity of its origin, and the important parts in its vicinity, it is much better, as a general rule, to tie the external or common carotid.

IV. The Facial Artery may easily be tied by cutting through the skin and cellular tissue that cover it where it turns over the jaw, at the anterior border of the masseter; but such an operation can hardly ever be requisite.

V. The Arteria Innominata has been tied in cases of aneurism of the right subclavian, extending inwards as far as the scalenus. The patient being placed on his back, with the shoulders raised and the head thrown back, one incision, two inches in length, is to be made along the inner margin of the sterno-mastoid muscle, terminating at the clavicle, and another across the origin of that muscle, meeting the former at a right angle. The flap of integument thus formed is to be turned up, and the sternal and part of the clavicular origin of the sterno-mastoid are to be divided on a director, which is to be passed behind the muscle, and kept as close to it as possible. The cellular tissue and fat which now appear, being turned aside, the sterno-hyoideus, and sterno-thyroideus muscles must be separately divided on a director. A strong fascia, which next appears, must be cautiously scratched through, and the carotid be traced with the finger down to its origin. Then the vena innominata being depressed, a ligature may be carried from without inwards, round the artery, close to its bifurcation, taking care to avoid the vagus, recurrent, and cardiac nerves.

VI. The Right Subclavian Artery, in the first part of its course, that is to say, between its origin from the innominata and the scalenus muscle, may be tied by an operation almost precisely similar to the latter; but it is the most difficult operation in surgery, and the most unsuccessful. This artery and the innominata have each been tied four or five times in cases of aneurism of the subclavian, reaching inwards as far as the scalenus, but with no very happy results.*

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* For further particulars of Mr. Guthrie's operation, see Lancet, 1850, vol. ii. p. 143.

VII. THE SUBCLAVIAN ARTERY of either side may be readily tied external to the scalenus muscle. The patient should be laid on a table, with the shoulder of the affected side drawn down as far as possible, and the head slightly turned to the other side. An incision must then be made above and parallel with the clavicle, three or four inches in length. It should cut through the skin and platysma, and should extend from the margin of the sterno-mastoid to that of the trapezius. This preliminary incision may be conveniently made by drawing down the skin, and cutting through it while it is steadied on the clavicle. The superficial fascia must next be divided to the same extent, taking care not to wound the external jugular vein. If the sterno-mastoid muscle has rather a wide attachment to the clavicle, some of its fibres may be divided, to give more room. The succeeding steps of the operation consist in cutting cautiously through the cellular tissue and fascia down to the outer edge of the scalenus muscle. Many surgeons tear through them with a director or blunt silver knife. The point of the finger must next be passed along the scalenus down to the rib, and in the angle between that muscle and the rib, the artery will be found. The needle must be passed round it from below upwards. If there is much difficulty with the common needle, that of Dr. Mott or Mr. Weiss, with a contrivance for separating the point, and bringing it and the ligature round on the other side of the vessel, may be used instead.

VIII. THE AXILLARY ARTERY below the clavicle may be tied by making a semi-lunar incision, with its convexity upwards, from near the sternal end of the clavicle to the anterior margin of the deltoid muscle. The skin, superficial fascia, and clavicular fibres of the pectoralis major muscle, are to be divided in succession, avoiding the cephalic vein and thoracica acromialis artery, where they pass between the pectoralis and deltoid. The flap being turned down, a strong fascia which intervenes between the pectoralis minor and subclavian muscles is next to be divided on a director; the cellular tissue and veins covering the vessels are to be turned aside; then the axillary vein being pressed downwards, a ligature is carried round the artery from below upwards. This operation is exceedingly difficult, and only to be performed in case of wounds.

It is much more easy to tie this artery in the axilla. The arm being widely separated from the trunk, and the fore-arm supinated, an incision three inches in length is made over the head of the humerus, between the margins of the pectoralis major and latissimus dorsi muscles, but rather nearer the latter. The cellular tissue having been dissected through so as to expose the vessel, and the vein and nerves drawn aside, the aneurism needle should be passed from the inner side.

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* The right subclavian was tied in the first part of its course by Mr. Partridge, in the King's College Hospital, in February, 1841. The patient died four days afterwards, apparently from irritation of the pneumogastric nerve.

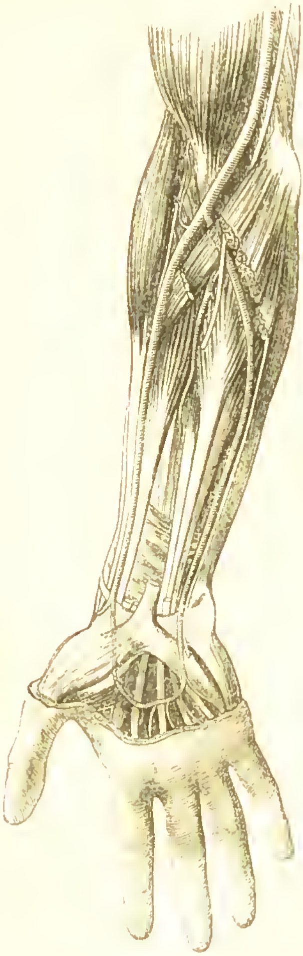
IX. THE BRACHIAL ARTERY is superficial in the whole of its course, and may be tied by making an incision two inches in length on the inner border of the coraco-brachialis muscle in the upper part, and of the biceps in the lower part of the limb. The incisions must be directed towards the centre of the limb, and the cellular tissue must be divided with caution, so as not to injure the internal cutaneous nerve, which lies superficial to the artery in the upper part of its course. At the lower part of the limb, the basilic vein must be avoided. It must be recollected that the median nerve lies over the artery in the middle of its course, and that the vessel has two venæ comites, both of which must be carefully excluded from the ligature. Before tying the ligature, it should be ascertained whether or not there is a *high division* of the artery, and whether the trunk that is exposed commands the circulation at the wounded or aneurismal part.

In the case of a small puncture of this artery at the bend of the elbow, from carelessness in bleeding, the surgeon may either close the wound, and attempt the cure by compression—placing a graduated compress on the wound—bandaging the whole limb—and keeping the patient in bed and on low diet, so as to maintain a tranquil state of the circulation; or may at once enlarge the wound upwards and downwards to the extent of three inches, divide the fascia to the same extent, and tie the vessel above and below the wound—recollecting that the median nerve lies to its inner side. There are authorities for both practices. Supposing an aneurism to follow such an accident, it is better to cut into the tumour, and tie the vessel above and below it, than to trust to one ligature at the lower part of the arm.

X. THE RADIAL ARTERY in the upper third of the fore-arm may be tied by making an incision three inches in length, in a line from the bend of the elbow to the thumb, through the skin and superficial fascia, avoiding the veins. The supinator longus and pronator teres being drawn asunder, and the deep fascia being divided to the same extent, the artery will be exposed, with its accompanying veins, which are to be carefully separated before the ligature is passed. The aneurism needle should be introduced from without, in order to avoid the radial nerve, which lies at a distance on the radial side.

This vessel can be readily tied in its middle third by making a similar incision through the same parts on the ulnar border of the supinator longus, and in the lower third, by making an incision on the radial side of the flexor carpi radialis. It may also be tied at the back of the carpus, just before it dips into the palm between the first and second metacarpal bones, by making an incision between the tendons of the extensor secundi and primi internodii pollicis. But it is easier to tie it at the lower part of the fore-arm.

XI. ULNAR ARTERY.—When this vessel is wounded in its upper third, where it is covered deeply by muscles, it is an undecided point whether the wound should be dilated, cutting through or across the muscles to reach the bleeding point, or whether the lower end of the brachial should be tied. In the middle and inferior thirds of the fore-arm, this vessel may be readily exposed by cutting through the integuments and superficial fascia along the outer margin of the flexor carpi ulnaris for the extent of three inches. That muscle is then to be drawn inwards, the deep fascia to be divided, the veins to be separated from the artery, and the needle to be passed from within, so as to avoid the ulnar nerve which lies on the ulnar side.



In wounds of the palm of the hand, with great hæmorrhage, the wound should be dilated, and the bleeding vessels be tied, unless they lie too deeply. If that is the case, methodical pressure should be resorted to—the wound being cleared of coagula, and filled with lint (which may or may not be dipped in oil of turpentine), and firm pressure being made upon it, before and behind, in the manner described at p. 299. But if hæmorrhage has recurred again and again, and the parts are inflamed or infiltrated with blood, the brachial artery should be tied just above the elbow. If an operation is required at all, it is better at once to do this, since the anastomoses are so numerous, that after tying both radial and ulnar above the wrist, the hæmorrhage may still continue through the interosseal arteries.

XII. The Aorta, the Common Iliac, and the Internal Iliac arteries, may be tied by a similar operation. An incision from four to six inches in length must be made on the anterior surface of the abdomen. It may either be made parallel to the outer border of the rectus, or to the epigastric artery—and it should terminate an inch above Poupart's ligament. The three layers of abdominal muscles are to be cautiously divided to the same extent—and the fascia transversalis likewise—it being first scratched through, so that the finger may be introduced between it and the peritonæum—to divide it upon. The peritonæum must now be detached by the fingers from the iliac fossa, as far as the brim of the pelvis, where the external iliac artery will be found beating—and by following this vessel upwards, the operator will come upon the internal or common iliac, or the aorta. The edges of the wound being now held asunder by copper spatulæ, the artery to be tied must be separated from its vein with the nail of the forefinger or the flat end of a probe, and the aneurism needle be passed round between it and the vein. It will be recollected that the common iliac veins lie behind and to the right of their respective arteries—that the left internal iliac vein is behind its artery—and that the right is a little external as well as posterior. The internal iliac may require to be tied for disease or injury of the glutæal or other branches outside the pelvis.

XIII. The External Iliac artery may be tied, according to Sir A. Cooper's method, by making a semi-lunar incision (with the convexity looking downwards and outwards) from near the anterior superior spinous process of the ilium to the superior angle of the external abdominal ring. This incision will be nearly parallel with Poupart's ligament, and about an inch above it. The skin, superficial fascia, and tendon of the external oblique having been divided, the lower margin of the internal oblique and transversalis muscles must be raised on the finger and be detached from Poupart's ligament, the fascia transversalis must be carefully scratched through, and then, if the finger is passed back under the spermatic cord, it will come in contact with the artery. The dense cellular tissue connecting the artery with the vein (which lies on its internal and posterior aspect) must be scratched through, and the needle be passed between them.*

XIV. The Femoral artery may be tied in any part of its course from Poupart's ligament downwards, but the best spot for the ligature, when performed for popliteal aneurism, is just above the part where the vessel is overlapped by the sartorius—some little distance below the origin of the profunda. The patient being placed on his back, with the knee slightly bent, and the limb turned outwards, an incision must be made through the skin in the course of the vessel—which, it will be recollected, corresponds to a line drawn from the middle of Poupart's ligament to the inner edge of the patella. The incision may commence two inches below the groin, but its length must depend on the thickness of the parts to be divided. It is better to make it too long than too short. The cellular tissue must next be dissected down to the fascia lata—avoiding the saphenic vein. If any glands are in the way, they should be turned aside. The fascia lata is now to be divided for about two inches, and the sartorius to be gently drawn outwards. The artery may now be felt, and when the sheath and the cellular tissue over it have been raised with the forceps and divided by cautious touches with the knife, (held with its flat surface towards the artery,) the point of the aneurism needle is to be gently insinuated between the artery and the vein (which lies behind it). The needle should be passed from the inner side. Before finally tightening the ligature, the artery should be compressed, to see whether the pulsation in the aneurism ceases, as there might be a double artery, or some other irregularity in the course and distribution of the vessel.

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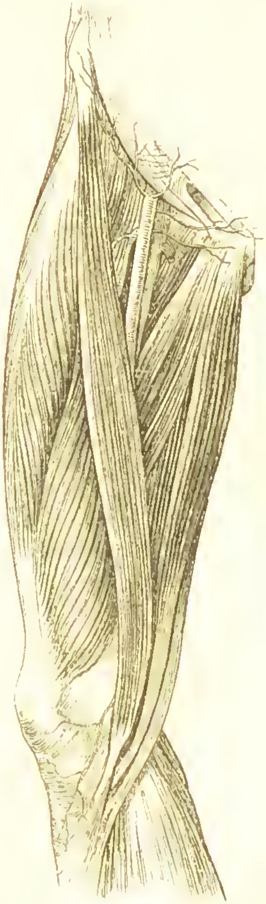
* This artery was tied by Mr. Partridge, in the King's College Hospital, in November 1846, for aneurism of the common femoral, in a patient only 23 years old. It was tied by Mr. Thomas Nunn, in January 1849, for aneurism of the common femoral, and by Mr. H. Smith, in August 1850, for aneurism of the superficial femoral high up. The ligature came away on the twenty-eighth day All three patients did well.



The FEMORAL artery may also be tied in the middle third of the thigh, where it is covered by the sartorius, by cutting on the inner edge of that muscle and turning it aside, and then slitting up the strong fibrous sheath which envelopes the artery at that part; but this is a much more difficult operation, and it has no commensurate advantages.*

XV. THE GLUTÆAL artery may be tied by placing the patient on his face, with the toes turned inwards, and making an incision from an inch below the posterior spinous process of the ilium, and an inch from the sacrum, towards the great trochanter. This incision should be about four inches long. The fibres of the glutæus maximus having been cut through or separated to the like extent, and a strong fascia beneath having been cut through, the vessel will be found emerging from the upper part of the sciatic notch. The SCIATIC artery may be found by making an incision through the same parts and for the same extent, but an inch and a half lower down. Both these operations are extremely difficult, from the great depth to which the dissection must be carried, the unyielding nature of the surrounding parts, and the hæmorrhage from the numerous blood-vessels that must necessarily be wounded. They should be attempted, however, in case of wounds; but for aneurisms of these arteries, it is necessary to tie the internal or common iliac.

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* "When the skin and fascia have been divided," says Mr. Fergusson, "and some muscular fibres exposed, it may be doubtful to which muscle they belong —whether to the sartorius or the vastus If to the latter, they will seem to run towards the inner side of the thigh; if the former, they will pass nearly in its long axis."—Practical Surgery, p. 312.

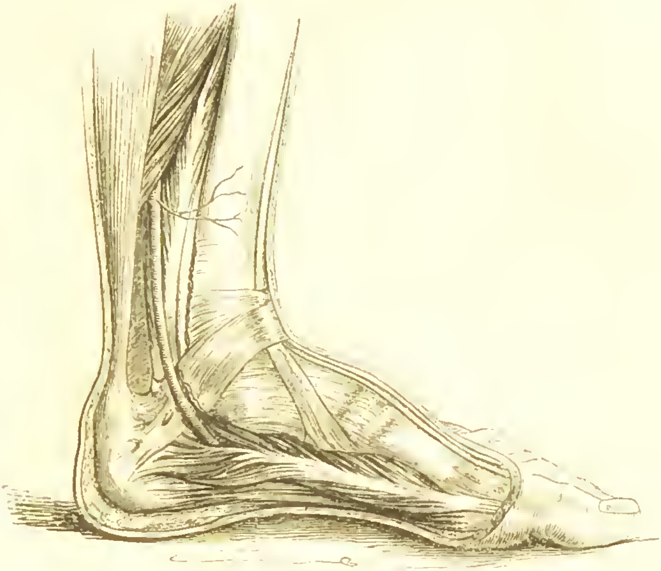
XVI. The Poplitæal artery may be tied by cutting through the skin and fascia lata for the extent of three inches on the outer border of the tendon of the semi-membranosus muscle, the patient being placed on his face, with his knee straight. On pressing that tendon inwards, the artery may be felt. Its vein, which lies superficial and rather external to it, must be cautiously separated and drawn outwards, and the needle be passed between them. This operation is very seldom performed.

XVII. Posterior Tibial Artery.—The operation usually recommended for tying this artery in the upper part of the leg is performed thus: The limb being placed on its outer side, with the knee bent and the foot extended, an incision four inches in length must be made through the skin and fascia over the inner margin of the tibia, avoiding the saphena vein. The edge of the gastrocnemius thus exposed is to be turned back. A director must then be insinuated beneath the inner head of the solæus, and this muscle must be divided from its attachment to the tibia. The strong and tense fascia beneath it must next be divided in the same manner. Then the muscles being relaxed as much as possible by bending the knee and extending the foot, the artery may be felt about an inch from the edge of the tibia. The veins are to be separated from it, and an aneurism-needle passed round it from without, inwards, so as to avoid the nerve.

This operation, however, is considered by Mr. Guthrie to be so "painful, difficult, bloody, tedious, and dangerous," that he proposes to reach the artery by making a perpendicular incision six or seven inches in length, at the back of the leg, through the skin, gastrocnemius, plantaris, and solæus, then the fascia will be exposed with the artery beneath it, and the nerve to the outer side. Perhaps this operation cannot be spoken of in much more complimentary terms than the preceding one.

The posterior tibial artery may be easily exposed, in the lower third of the leg, by cutting parallel to the tendo Achillis, and on its inner side, for the extent of two or three inches, through the skin and two layers of fascia. The cellular tissue and sheath of the vessel must next be cautiously divided, and the venæ comites having been separated from it, the needle must be passed round the vessel from the outer side.

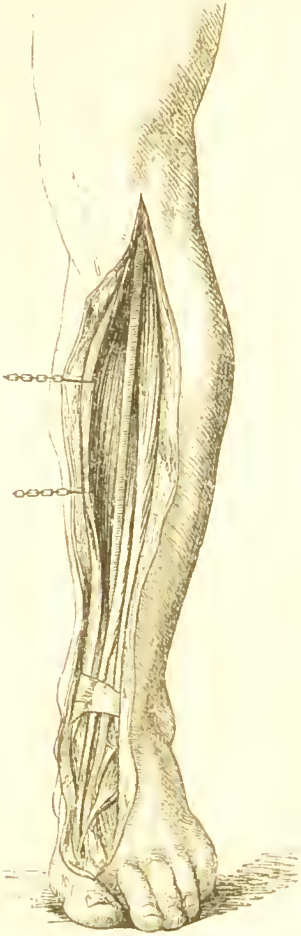
This artery may also be tied behind the inner ankle. A semilunar incision, two or three inches long, is made in the hollow between the heel and the ankle, but rather nearer to the latter. The integuments, the superficial fascia, and a very strong tendinous aponeurosis, continuous with the deep fascia of the leg, must be successively divided to the same extent. The sheath of the vessels which will be thus



exposed must be opened, the venæ comites separated, and the needle passed from the heel towards the ankle in order to avoid the nerve, which lies a little nearer to the heel.

XVIII. The Peronæal artery may be exposed in the upper part of the leg by an incision similar to that which Mr. Guthrie proposes for the ligature of the posterior tibial, only rather more external. For the first few inches of its course, this vessel lies underneath the deep fascia; afterwards it lies concealed under the inner edge of the flexor longus pollicis, which must be turned aside to expose it. But this is an operation which is enumerated rather from form than because it is of real utility.

XIX. The Anterior Tibial artery in the first third of its course, where it is covered by the extensor muscles, is very difficult to reach. If, however, it is expedient to place a ligature on it, an incision four or five inches in length must be made down to the fascia, in the direction of a line drawn from the head of the fibula to the base of the great toe. The intermuscular septum, between the tibialis anticus and extensor digitorum muscles must then be cut into, and the muscles be separated down to the interosseous ligament, where the artery will be found. The foot should be moved backwards and forwards at the ankle, in order to ascertain with exactness the junction of the muscles.



Below the middle of the leg, at any point to the termination of its course, this artery may be found on the fibular side of the extensor proprius pollicis tendon, which must be the guide for the incision. But it lies much more deeply in the living subject, than would be surmised from a mere dissection of the dead. The coverings must be divided with the usual precautions, and neither the peronæal nerve nor the venæ comites should be wounded with the knife, or be included in the ligature.

In wounds of the arteries in the sole of the foot (except perhaps of the external plantar, opposite the base of the little toe) before enlarging the wound with the view of securing the bleeding point, methodical pressure should be applied after the manner recommended at page 299; if that fails, the posterior tibial artery should be tied behind the inner ankle, and the anterior tibial on the dorsum of the foot likewise, if necessary.*

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* For further information on these operations, vide Mance on the Arteries; the works of Harrison, Liston, and Fergusson, and Brittan's Translation of Malgaigne.

CHAPTER VII.

OF CHLOROFORM, AND OTHER MEANS OF PRODUCING INSENSIBILITY TO PAIN.

HISTORY.—LAST in our work, and last in the date of its discovery, but by no means least in importance, comes that modern method of procuring unconsciousness to pain, which promises to be one of the greatest blessings that medical research has yet conferred on mankind.

So terrible is the idea of the surgeon's knife, that it cannot be wondered at that many attempts have been made, at various times since surgery was first cultivated, to diminish the tortures which it inflicts, both in apprehension and in reality. Dr. Simpson * brings forward quotations from Dioscorides, Pliny, and Apuleius, authors of the Augustan age, showing that in that age the root of the mandragore or mandrake (*atropa mandragora*) steeped in wine was given to cause insensibility (ποιεῖν ἀναισθησίαν) in persons who were to be cut or cauterized, and that whilst the influence of this remedy lasted, a member might be cut off without any pain or sensation. The seeds of the rocket (*eruca*) were infused in wine and drunk, according to Pliny, by criminals about to undergo the lash, in order to induce a certain recklessness or hardihood of feeling. The vinegar mingled with gall, mentioned by St. Matthew (or the wine mingled with myrrh, as it is rendered by St. Mark), which was offered to our Saviour before his Passion, furnishes an instance familiar to every one. The *bang*, or extract of Indian hemp, is used in India for the same purpose at the present day. Dr. Simpson has shown further that the inhalation of narcotic vapours was used as a preparatory to surgical operations in the thirteenth century. Towards the end of the eighteenth century, Mr. James Moore, son of Dr. Moore, of Clifford Street, and lately house-surgeon to St. George's Hospital, introduced a plan for diminishing the sensibility of limbs before amputation, by compressing the sciatic and crural, or other principal nerves. This he effected by means of an instrument resembling in principle Signoroni's tourniquet, depicted at p. 310, except that his instrument consisted of a horse-shoe shaped arch of steel with a pad at each extremity, and a screw to act upon one of the pads. Moore was permitted by John Hunter, in 1784, to try his plan upon a patient in St. George's Hospital who had lost all his toes, and had a large irritable ulcer on his foot, and whose leg, after having been submitted to the process, was cut off below the knee by Mr. Hunter, with an extremely small amount of pain.† This plan, however, was soon given up; it is not certain, and is not without some disadvantages; for Malgaigne,[*] who attempted by this means to benumb a patient's leg before an operation, found not only that the degree of anæsthesia was incomplete, but that considerable pain was caused by the compression. Just at the end of the last century, the brilliant discoveries of oxygen and other gases, by Priestley, Black, and Cavendish, and the fervent study of *pneumatic chemistry*, created a new, though very short-lived, branch of therapeutics: the attention of the profession was directed to *pneumatic medicine* as it was called; a Medical Pneumatic Institution was set up at Clifton by Dr. Beddoes,[†] with huge reservoirs of gases for the consumption of the patients;—Humphry Davy, just out of his apprenticeship, was appointed superintendent in 1799; — his experiments on the inhalation of nitrous oxyde added to the excitement;—S. T. Coleridge, Robert Southey, John Rickman, P. Roget, Boulton, Watt, Wedgewood, and others, since distinguished as poets and philosophers, eagerly made proof of the effects of the intoxicating gas;—the *gaz oxygenium* and *gaz acidum carbonicum*, and other gases, took a rank in the Materia Medica which they soon, however, were obliged to resign; and medical men fondly hoped they had at last found the simplest and most philosophical remedies, believing that they might stimulate by the inhalation of oxygen or nitrous oxyde, and depress or narcotize by carbonic acid, hydrogen, and azote, till experience ruthlessly proved the fallacy of these, as of many other ingenious and plausible speculations. Davy found that the nitrous oxyde relieved him from a severe headache, and from the pain of cutting a wisdom tooth; and he threw out the hint that as it appeared capable of destroying physical pain, so it might probably be used with advantage during surgical operations.[‡]

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* Edinburgh Monthly Journal of Medical Science, December, 1847.

† A method of preventing or diminishing pain in several operations of surgery, by James Moore, member of the Surgeons' Company of London. 1784.

Nothing in good earnest, however, was done; there was no established or systematic use of anæsthetic means until the year 1844, when Horace Wells, a dentist of Hartford, Conn. U. S., inhaled the nitrous oxyde gas himself before one of his teeth was extracted, with the effect of producing a complete unconsciousness of pain, and administered it to several patients who underwent the same operation, with the same beneficial results. In the December of that year he visited Boston, and made public trial of the administration of the gas, before the Medical College of that city. But this experiment failed from want of proper management, and the failure subjected Wells to so great an amount of ridicule, that he fell sick through vexation, retired from practice as a dentist, engaged himself in stuffing and exhibiting birds, and in the sale of shower-baths; afterwards came to Europe as a picture-dealer, then returned to America, became more and more unsettled in his mind, and died by his own hand in January, 1848.

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[*] Malgaigne's Operative Surgery, by Brittan, p. 42.

[†] A Letter to Erasmus Darwin, M.D., on a New Method of Treating Pulmonary Consumption. By Thomas Beddoes, M.D. Bristol, 1793.

[‡] Vide Memoir of Sir H. Davy, by his brother, John Davy, M.D., Lond. 1839; and, Researches, Chemical and Philosophical, by Humphry Davy, Superintendent of the Medical Pneumatic Institution, Lond. 1800, p. 465, *et seq.*

But the experiment of Wells at Boston, fatal as its results were to himself, was not altogether devoid of fruit. W. G. T. Morton, had been a pupil and partner of Wells, and afterwards settled in Boston, where he studied medicine and chemistry for a short time under Dr. Charles T. Jackson, and then practised as a dentist. He was the person who introduced Wells to the Medical Society of Boston, and a share of the ridicule attached to the unsuccessful experiment, fell upon his shoulders. It appears that the idea of finding some means of extracting teeth without pain occupied the attention of both Morton and Jackson, and was the subject of conversation between them. Morton learned from Jackson the use of chloric ether as a local application to aching teeth. Both had read in Pereira's work on Materia Medica, that the vapour of sulphuric æther was inhaled in spasmodic asthma, chronic catarrh, and hooping cough, and to relieve the effects caused by the inhalation of chlorine gas. In fact, for these purposes, the inhalation of ether, pure, or medicated with conium or other substances, was a well known and not uncommon remedy, and had been spoken of by various authors from the time of Beddoes and Richard Pearson* in the latter end of the eighteenth century. Jackson himself had inhaled ether to relieve the irritation caused by accidentally breathing chlorine gas.

Morton's Discovery.—But the merit of first employing the inhalation of ether in such a way as to produce a decided and controllable state of insensibility to the pain of surgical operations, is undoubtedly due to Morton. He first made several experiments on himself, with imperfect success, arising from the great difficulty of procuring ether sufficiently pure; but having at last, on the 30th of September, 1846, by inhaling it from a flask through a glass tube, succeeded in making himself unconscious, he determined to try the experiment on the first fit subject that presented himself, and the very same evening, a man, Eben H. Frost by name, having applied to have a tooth extracted, and being wonderfully timid, and wishing to be mesmerised in order that he might feel no pain, he was easily persuaded to inhale some ether from a handkerchief. He soon became unconscious, and Morton extracted a bicuspid tooth, the patient knowing nothing of the operation till he recovered his senses, and saw the tooth lying on the floor. A Dr. Hayden who held the lamp for the operator, and one Tenny a journalist, were witnesses of the fact, and together with the patient, immediately drew up and signed a document attesting it. And so, a new era in surgery began with the painless extraction of Frost's tooth by Morton, at 19, Tremont's Row, Boston, at nine in the evening of the 30th of September, 1846.

Morton lost no time in prosecuting the discovery he had made, although he did not at first disclose the nature of the agent employed. He continued to make experiments at his own house, and having made the subject known to Dr. Warren, was permitted to introduce his anæsthetic agent into the practice of genuine surgery, and on the 16th of October, administered the ether in the Massachusett's General Hospital at Boston, to a patient from whom Dr. J. C. Warren removed a tumour in the neck; and on the day following to a patient from whose arm a tumour was extirpated by Dr. G. Hayward. From that time the use of the novel remedy spread rapidly in all directions; but before pursuing its history we must drop a passing word of regret at its disastrous effects on the fortunes of its discoverer. Morton endeavoured to make a mystery of the means he employed, and to secure to himself, by patent, the exclusive right of administering it. But Jackson seeing that the thing promised to be both famous and lucrative, now laid claim to the discovery as his own, on the plea that certain information which he had given Morton respecting the properties of ether, had directly led Morton to the use of it. To pacify Jackson, and bar any claims he might hereafter set up, he was allowed a share in the patent which was taken out. Nevertheless he sent a communication to the French Academy, in which he suppressed Morton's name, and claimed the whole discovery as his own. Meanwhile the patent turned out to be good for nothing, and Morton, who had neglected his business, and injured his health by the excitement of his discovery, was left with his pockets empty, and even the bare honour of the invention almost wrested from him.*

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* Short Account of Different Kinds of Airs, so far as relates to their Medicinal Use, by Richard Pearson, M.D. Birmingham, 1795.

From America the news of the discovery was conveyed to England in a communication from Dr. Bigelow, of Boston, to Dr. Francis Boott, and it was received most cordially.† On the 21st of December, 1846, Mr. Liston tried the ether with the best possible results in a case of amputation of the thigh, and of evulsion of the toe nail. On the 31st, Mr. Fergusson used it in the King's College Hospital, and in less than a fortnight it was tried by almost every surgeon in the kingdom; whilst the medical periodicals for a long time were crowded with fresh instances of its powers in alleviating suffering, and with descriptions of various apparatus for administering the vapour. It was employed in every variety of surgical operation, from the Cæsarian section, in which it was used by Mr. Skey, at St. Bartholomew's Hospital, on the 25th of January, 1847, down to tooth drawing, and in all kinds of painful examination or manipulation, as for instance in passing a catheter through a painful stricture; it was used in cases of strangulated hernia and of dislocation, and in the obstetric operation of turning, in order to diminish the resistance of the muscles; in various cases of painful and spasmodic affections, such as tetanus, neuralgia, and spasmodic asthma; it was employed to tranquillize the insane, to detect feigned disease, and to diminish the sufferings incidental to parturition. It was used too on infants, on the aged, and on animals.

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* See a Report of the Trustees of the Massachusett's General Hospital, with a History of the Ether Discovery, in Littell's Living Age, Boston, 18th March, 1848.

† Vide Lancet, January 2, 1847 and all the medical periodicals of that year, *passim.*

The Effects of the Inhalation of Ether depend without doubt on its entrance into the blood, and circulation through the nervous centres and rest of the body. The younger the patient, and more active the circulation, the sooner are its effects produced. At first there is usually some slight coughing, the pulse and breathing are quickened, the face flushed, the eye suffused and unsteady, and there is more or less mental excitement; but, if the inhalation be continued, the limbs sink relaxed, the breathing becomes deep and somnolent, the eye turned upwards and fixed, and in this state there is complete insensibility of external impressions, so that surgical operations can be performed without the patient's consciousness. If the amount of narcotization be pushed beyond this point, the reflex function of the spinal cord might be interfered with, respiration become slow and laborious, and death take place with the ordinary phenomena of coma.

During the period that ether was largely employed, there were some few cases in which death followed its administration; but there can be little doubt but that death was *post* and not *propter*.

CHLOROFORM.—Brilliant as was the career of the ether discovery, it was destined soon to be eclipsed. Ether, whose chemical symbol is C_4H_5O, is one of a numerous class of bodies, all composed of hydrogen and carbon, with variable proportions of oxygen or some other electronegative; the hydrocarbon playing the part of a base, and the other element that of an acid radical. Dr. J. Y. Simpson of Edinburgh, believing that amongst these bodies some might be found equal or superior to ether, made many experiments on himself and friends with chloride of hydrocarbon, acetone, nitrous ether, and other analogous substances, and at last, on the 4th of November, 1847, in company with Dr. Keith, and Dr. Matthews Duncan, found in a heavyish liquid that had been put by and almost forgotten, an agent which was manifestly equal to ether in its narcotizing virtues, and immeasurably more pleasant.* This was *chloroform*. It had been investigated some time before by Dr. Glover, and it was recommended to Dr. Simpson by Mr. Waldie of Liverpool; moreover, inhalation of the fumes of that solution of it in alcohol which is known by the name of *chloric ether* had been tried some time before by Mr. Jacob Bell; but undoubtedly the merit of establishing the anæsthetic power of chloroform, as a matter-of-fact, belongs to Dr. Simpson.

Chemical History.—Chloroform is a terchloride of a hypothetical base, termed Formyle, which consists of two atoms of carbon, and one of hydrogen. Hence the symbolic designation of chloroform is C_2H,Cl_3. It was discovered by Soubeiran in 1831, by Liebig in 1832, and by Mr. Samuel Guthrie of Sacket's Harbour, New York, in the same year;† its real nature was ascertained by Dumas and Peligot in 1835. It is obtained by distilling rectified spirit with water, and chloride of lime, in the proportions of four pounds of powdered chloride of lime, twelve pounds of water, and twelve fluid ounces of rectified spirit. These are mixed and distilled, so long as a dense liquid, which sinks in the water with which it comes over, is produced. It is rectified by agitating it with the strongest colourless sulphuric acid, which if it contain any impurities, such as the empyreumatic oils with which it is liable to be contaminated, at once destroys them by charring, and renders them manifest by the dark colour of the line where the chloroform and acid come into contact. It is poured off and agitated with fresh acid if necessary, then poured carefully off into a dry stoppered bottle, and shaken with some peroxyde of manganese, from which it may be decanted, fit for use.*

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* Vide Miller's Principles of Surgery, 2nd edit. p. 756.

† Cogswell, Lancet, 1847, vol. ii. p. 631; Waldie, *ib.* p. 687.

Pure chloroform is a dense colourless liquid, having the specific gravity, when quite pure, of from 1·480 to 1·5. It is exceedingly volatile, and boils at about 140°. It has an agreeable sweet fruity smell and taste, and if poured on a piece of blotting paper and evaporated, ought to leave no oily empyreumatic smell behind. By passing its vapour through a red hot tube, it is decomposed and hydrochloric acid is given off, which may be detected by means of paper moistened with solution of nitrate of silver. By such a process Dr. Snow has detected it in the bodies of kittens poisoned by a very minute quantity of it, and in the muscles of a child's leg which had been amputated at St.George's Hospital after inhalation of the vapour.

Chloroform is almost incombustible, thus offering an advantageous contrast to ether, from the explosion of which, at least, one serious accident has happened during its administration.†

Effects on the Animal Economy.—It is convenient to divide the effects of the inhalation of chloroform into stages, or *degrees* as Dr. Snow‡ more properly calls them. The first or slightest degree corresponds with what is commonly known as slight intoxication. The mental faculties are excited, vision, perhaps, unsteady, and the gait staggering, but still there is perfect consciousness of all that is going on. In this degree, the severe pain of operations is still felt intensely; but that part of suffering which depends on mental apprehension is relieved, "the mind sometimes does not feel pain, simply because it is taken up with other things, just as a man in battle often does not feel a wound." § The capillary circulation is greatly excited, and the whole surface, especially the face and conjunctivæ, become suffused with red.

In the *second* degree there is no longer correct consciousness; the mental faculties are almost abolished; the inhaler generally neither speaks nor moves, though it is possible for him to do both; and he is in the condition, as Dr. Snow remarks, which the law terms drunk and incapable. There is sometimes considerable unruliness, or vivid dreaming; the insensibility of pain is greater than in the first degree, but yet not enough for beginning a severe operation. This degree is, however, very transitory, and soon passes into the next, if the inhalation be prolonged, or into the first, if it be discontinued.

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* Gregory, quoted in Ranking's Abstract, vol. xi. p. 231.

† Vide Med. Gaz., 20th Sept. 1850.

‡ Lond. Med. Gaz. 1848.

§ Sibson, Med. Gaz., N.S. vol. vi. p. 276.

In the *third* degree there is a cessation of all voluntary motion and mental operation; the pupils are contracted, and the eye turned upwards as in sleep; sometimes a few of the muscles, especially of the jaws, become rigid, but relax if the inhalation be continued; the patient too may wince under the knife, if the operator begins a trifle too soon, but is quite unconscious of pain.

The *fourth* degree approaches the condition known as *coma;* it is marked by general insensibility, and tendency of the pupil to dilate.

In the *fifth* degree, the reflex function of that part of the nervous system which presides over respiration is abolished, breathing becomes irregular, and death ensues.*

Dose.—In speaking of the quantity or *dose* of chloroform that it is safe to administer, it must be remembered that it is not the mere quantity inhaled, without reference to time, but the quantity present in the blood in a given time, which is to be regarded. Patients may be kept under its influence a long time, and thus may inhale a large quantity with safety; but even a small quantity too rapidly inhaled and insufficiently diluted with air may produce a dangerous degree of narcotism. When we hear the dose of chloroform estimated by drachms, and are told of a patient who consumed thirty-two ounces in the twenty-four hours, we must not forget that it is the actual quantity present in a given time in the blood, and its effects on the sensibility and respiration that are to be the real guides as to the safety or danger of the quantity administered, and not mere quantity by measure. According to Dr. Snow, whose patient and accurate investigations of the subject are above all praise, about twelve minims of chloroform circulating in the blood of an adult produce the second degree of narcotism, eighteen minims the third degree, in which operations are performed, twenty-four minims the fourth degree, in which there is complete relaxation with insensibility; a little more than thirty suffice to arrest respiration, and thirty-six or thirty-seven to stop the action of the heart. These numbers refer to the quantity actually circulating in the blood at a given time. It is necessary also to bear in mind, that when a patient is inhaling air highly charged with chloroform, the narcotic effects continue to increase, as Dr. Snow has pointed out, for twenty seconds, after the inhalation is discontinued; owing to the absorption of the vapour remaining in the lungs.

Mode of Administration.—The first question that arises is shall the chloroform be administered with, or without apparatus? No doubt either method is safe in competent hands, but the apparatus of Dr. Snow enables the person administering the vapour to regulate the dose. Out of the fourteen cases in which death has been caused by the remedy, a handkerchief or towel was used in at least ten.†

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* See an interesting set of experiments by T. Wakley, jun. Lancet, 1848, vol. i. p. 19.

† See a paper by Dr. Snow, containing a list of thirteen fatal cases, Med. Times, 31st Aug. 1850; and another fatal case, Med. Times, Sept. 21, 1850.

Dr. Snow's inhaler consists of a metallic vessel which contains the chloroform, within another vessel containing cold water, so that the vapour may be raised at an equal temperature; from this a flexible tube carries the vapour mixed with air to a face-piece or mask, the invention of Dr. Sibson, which incloses the mouth and nose and has an edge lined with thin lead, so that it can be bent and adapted to the shape of any face. This has an inspiratory valve, and an expiratory, both made of vulcanized India rubber; by opening the expiratory valve more or less during inspiration, the air is allowed access to the interior of the mask, and thus can be mixed with the chloroform vapour in any proportion.* Another simpler but less perfect apparatus consists of the same kind of mask, with one respiratory aperture within which is placed a piece of blotting paper soaked with twenty minims (equal to 130 drops) of chloroform which must be renewed from time to time, and another expiratory aperture, by removing the valve from which the free ingress of air is permitted.† If no special apparatus is used, a napkin may be folded in the shape of a hollow cone, its apex be soaked with twenty minims of chloroform, and this be put over the patient's nose and mouth. The inconvenience of allowing the liquid to touch the face, or get into the mouth must be remembered. In whatever way administered the patient should be in the recumbent posture, and the greatest quiet be observed. It is a good plan to let him be put to sleep before he is removed from his bed to the operating table. It is better that the stomach should be empty. The patient should be directed to expand his chest and draw in the vapour fully. There need be no hurry in the first stage of the process, because complete insensibility to pain, and absence of involuntary movement and wincing are more safely obtained after the vapour has had time to permeate all the capillaries and benumb all the peripheral nerves. Dr. Snow makes the most valuable observation, that insensibility to pain cannot be obtained in a *very rapid* manner without a dangerous degree of narcotism of the nervous centres. In order, therefore, to obtain as much of the former with as little as possible of the latter, the vapour should be given in a leisurely manner; the expiratory valve being at first drawn aside sufficiently to allow plenty of air to mix with the vapour, and being gradually closed. The inhalation should occupy three or four minutes before the third degree of narcotism is established; and then it will usually be but three minutes more before the patient evinces any sign of feeling the knife. Excitement or violence, is no cause of alarm: quite the reverse; it shows that the vapour should be administered more freely. The inhalation should be continued till the patient is narcotized in the third degree, and so soon, says Dr. Snow, as the eyelid can be raised and the conjunctiva touched without winking, the surgeon may begin. When the operation is fairly commenced it is not necessary to keep up so great a degree of narcotism; having secured the patient against the first plunge of the knife, he may be kept in a sufficient state of unconsciousness by giving him one or two inspirations of the vapour, whenever his countenance exhibits any signs of feeling.

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* One advantage of Dr. Snow's apparatus is, that it confines the inhalation of the vapour to the patient, and does not permit it to evaporate and be wasted in the air of the apartment. The writer has seen more than one nurse made sick by it when given from a handkerchief.

† The apparatus are made by Matthews, of Portugal Street, Lincoln's-Inn.

At every operation the management of the chloroform should be committed to one competent person, whose duty it should be to attend to it, and to nothing else. If the surgeon has no assistant he should himself thoroughly narcotize the patient before he begins his incisions. The administrator should be chiefly guided by the pupil, for if there is any dilatation of that it shows that the degree of narcotism is far too deep; by the sensibility of the surface of the eye when touched or blown upon; and by the breathing, which may be somnolent but not interrupted or too slow. The pulse affords no certain indication: yet if there be extreme feebleness it must be attended to.

The *class of patients* on whom chloroform acts most pleasantly are young children, in whom, says Dr. Snow, it scarcely ever causes either mental excitement, or any of the struggling which is not unusual in adults just before insensibility ensues. Moreover, immunity from pain is obtained with less narcotism of the nervous centres than in adults, and it is hardly ever necessary to carry the effects of the vapour beyond the second, or the commencement of the third degree. The very aged are long in recovering their consciousness after inhalation. The more feeble a patient is, the more quickly and pleasantly does the vapour generally act; if very strong and robust, considerable mental excitement is apt to occur in the second degree of narcotism, and struggling, or rigidity of the muscles, in the third.

Accidents from Chloroform.—The commonest is vomiting, which, however, is of very little consequence. If it occur during the inhalation, the patient's head must be turned to one side to let the vomited matter escape. If very troublesome afterwards, a little brandy and water, or a very small dose of opium, may be administered. The patient, if chilly, should be wrapt up warmly. If kept quiet in bed after the operation the patient will complain little of giddiness or headache. The prolonged insensibility, and other frightful symptoms which affected some persons, especially young women, after inhalation, when the remedy was a new one, were probably due to hysteria.

Death from chloroform, when occurring suddenly after a short inhalation, arises, without doubt, from the sudden entrance of so large a quantity as to paralyze the heart at once and kill by *syncope*. When it occurs after a more protracted inhalation, as in T. Wakley's experiments on the lower animals, the mode of dying is by *coma*. First, the intellectual and animal functions of the nervous system are abolished: then the reflex function which presides over respiration; the breathing becomes slow; the lungs congested; and at last breathing stops entirely, leaving the heart struggling for a short space.

There is no evidence, as Dr. Snow has fully proved, that death is caused by the entrance of blood or vomited matters into the glottis.

The only *antidote* worth mentioning is pure atmospheric air; so that the vapour exhaled in the lungs may be quickly carried off. In any case, therefore, in which the narcotism has been carried to a dangerous degree, the patient should be brought if possible into the open air, or at least the windows should be opened, and a current be created by fanning. Cold water dashed on the face and chest, is a good excitant to the respiratory act; and if this fails, the breathing must be kept up artificially, and probably a small quantity of blood be taken to relieve the congested lungs.

The cases in which the inhalation of chloroform is useful, comprise every surgical manipulation attended with pain, of which it seems not only to render the patient unconscious, but also to neutralize its depressing power, or power of producing collapse or *shock* to the constitution. To lull the pain during operations as well as the smarting after them; to lull the pain and shock of violent injuries, and of the surgical examination, and setting of fractures which follows; to facilitate the reduction of herniæ and dislocations, and the passing of catheters, these are its chief surgical uses. But its benefits are not confined to the abolition of pain; there is great reason for hoping that it renders operations less mortal; it enables the surgeon to proceed with his dissection in a more leisurely manner; it does away with the scruples of the over-modest woman, to whom the shame of exposure is worse than the pain of the knife, and it circumvents the opposition of the timid and unruly.

Cases in which it is inapplicable.—The solitary case in which, so far as the operation is concerned, it is best not to use chloroform, is the *extraction of cataract;* after which, as Mr. Haynes Walton has shown, any accidental fit of vomiting, might cause the whole contents of the eyeball to be forced out. Operations about the mouth admit of its use, as there is no fear of the blood getting into the glottis; but the patient's head must be turned on one side repeatedly, to let it run out freely. Full narcotism should be induced before these operations, and it should be kept up as well as it can by inhalation at intervals from a sponge wetted with cold water, on which twenty minims of chloroform have been poured. The vapour may be inhaled by infants, or by the aged, with perfect safety, if the process be conducted carefully. The cases in which on general principles it should be given with hesitation, are those of chronic organic disease of the brain, atrophy, or dilatation of the heart, and embarrassed circulation through the lungs. But since the shock of an operation is in itself extremely formidable to patients so affected, it is probable that a cautious administration of the anæsthetic would diminish the danger instead of adding to it. Epileptic patients are liable to have their fits induced by the inhalation.

Lastly, no person should ever administer chloroform to himself. Moreover it should never be made a plaything, or a luxury. This, like other medicines, is always used most safely, when there is fair necessity for its legitimate effects. Whenever there is an amount of pain to be suffered, which is likely to be detrimental to the health in any way, let it be used legitimately; but when it is considered that *if about twenty minims too much be inhaled into the blood at any given moment, the heart's action is irrecoverably stopped*, he must have something less than the courage and prudence of an Englishman who would consent to lose his consciousness in order to escape the pain of tooth-drawing, or who would run the risk of letting some bungler administer the vapour too hastily, and so send him into a sleep from which there is no waking.

CHLOROFORM COMPARED WITH ETHER, AND OTHER SUBSTANCES OF ITS CLASS.—Very many experiments have been made on other substances analogous in composition to chloroform, and on various combinations of them. Ether is much less pleasant than chloroform, more irritating to the air passages, and more apt to be followed by headache and other unpleasant symptoms, of which the persistent taste and smell of it in the breath are not the least. But it is much safer than chloroform, less rapid in its action, and only one-third as powerful; that is, at least three times the quantity is required to produce a given effect. Besides, it produces complete muscular relaxation more perfectly, so that it is perhaps preferable in cases of hernia, dislocation, and spasmodic stricture. The *Dutch Liquid*, or compound of chlorine and olefiant gas, so called because discovered by the Dutch chemists in 1795, resembles chloroform in its general effects, and is only about one-half so powerful or rapid in its action. It it not easy to procure. Mixtures of chloroform and alcohol have been tried in the hope that the effects of the former might be rendered slower and more persistent; but the chloroform evaporates first and leaves the alcohol behind, so that no advantage is gained. For fuller information on these subjects we can only refer to Dr. Snow's often quoted papers in the London Medical Gazette for the years 1848, —49, and —50.

OTHER ANÆSTHETICS. *Intense cold* has been recommended by Dr. James Arnott, of Brighton, for various therapeutic purposes, and amongst others, the checking the growth of cancer, and the production of local anæsthesia. Mr. Thomas W. Nunn* has published a case in which he removed some warty growths from the female genitals, with very little suffering to the patient, and very little hæmorrhage, although both are usually severe after such an operation: having first applied pieces of ice to the growths till they were blanched and cold. Before extirpating a tumour in any other position, pounded ice and salt might be applied in a bladder till the skin becomes quite benumbed. This method deserves further investigation.

Mesmerism.—There can be little doubt but that the manœuvres which are called mesmeric passes, if practised long enough upon a person whose credulity is great, and strength of mind little (no matter whether the mind be weak originally, or rendered so by illness), are capable of producing a kind of cataleptic condition, accompanied with insensibility to external impressions, and that in this state surgical operations have in some instances been performed without the patient's cognizance. But this one fact in mesmerism is mixed up with so much extravagant pretension, and with so much knavery and folly, besides that the very operation of mesmerizing is one that no virtuous woman ought to be submitted to, that we cannot consent to admit the mesmeric sleep into the list of therapeutical agents, until it can be shown that it can be practised without injury to the understanding and morals, and that it has advantages over chloroform and the other remedies which lay no claim to supernatural virtues.

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* Lancet, 1850, vol. ii. p. 262.

APPENDIX OF FORMULÆ.

§ I. Tonics.

F. 1. *Tonic Draught with Acid.*

℞. Acidi sulphurici diluti ♏v.—xv.; syrupi aurantii fʒj.; infusi cascarillæ (*vel* decocti cinchonæ), fʒx. Misce, fiat haustus, ter die sumendus.

For Children.

℞. Decocti cinchonæ lancifoliæ f℥iijß.; syrupi zinziberis f℥ß. acidi sulphurici diluti ♏xv. Misce; sumatur pars quarta ter die.

2. *Quinine Draught with Ammonia.*

℞. Quinæ disulphatis gr. ij.; tincturæ opii ♏ij—v.; spiritûs ætheris compositi, spiritûs ammoniæ aromatici, aa fʒß.; decocti cinchonæ fʒx. Misce, fiat haustus, ter vel quater die sumendus. *In cases of great Debility, with Restlessness or low Delirium.*

3. *Quinine Draughts, with Acid.*

℞. Quinæ disulphatis gr. ij.; acidi sulphurici diluti ♏v.—xv.; tincturæ aurantii, syrupi ejusdem, aa fʒj.; aquæ f℥j. Misce, fiat haustus, ter die sumendus.

℞. Quinæ disulphatis gr. ij.; acidi hydrochlorici ♏x.; camphoræ gr. ij.; spiritûs ætheris nitrici fʒj.; tincturæ cardamomi compositæ fʒj.; aquæ menthæ viridis fʒx. Misce, fiat haustus, sextâ quâque horâ sumendus. *A powerful stimulant and tonic.*

4. *Battley's Liquor Cinchonæ.*[*]

℞. Liquoris cinchonæ flavæ ♏xx.; aquæ pimentæ f℥j. Misce, fiat haustus, quater die sumendus. *In atonic erysepelatous diseases.*

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[*] One fluid drachm of this solution is equal to an ounce of the finest bark.

5. *Bark with Ammonia.*

℞. Decocti cinchonæ flavæ f℥viiß.; ammoniæ sesquicarbonatis ʒß.; syrupi zinziberis f℥ß. Misce. Dosis, pars sexta, bis vel ter die.

6. *Bark with Liquor Potassæ.*

℞. Decocti cinchonæ flavæ f℥viiß.; liquoris potassæ fʒij.; tincturæ cinchonæ compositæ fʒij. Misce. Dosis, pars sexta, bis vel ter die.

7. *Bark with Guaiacum.*

℞. Tincturæ guaiaci ammoniatæ, tincturæ humuli aa fʒß.; decocti cinchonæ lancifoliæ f℥ij. Misce, fiat haustus, ter die sumendus.

℞. Tincturæ guaiaci ammoniatæ fʒiv.; mucilaginis f℥ß.; tere simul et adde decocti cinchonæ f℥vi.; tinct. serpentariæ fʒij. Misce. Dosis, pars quarta bis die.

℞. Tincturæ guaiaci ammoniatæ, tincturæ cinchonæ compositæ singularum f℥j. Misce. Dosis, fʒij. bis die e cyatho lactis.

℞. Pulveris guaiaci gr. v.; pulveris cinchonæ ʒß.; pulveris cinnamomi compositi gr. x. Misce, fiat pulvis ter quotidie sumendus e theriaca. *In Chronic Rheumatism or Constipation with debility.*

8. *Syrupus Quinæ.*

℞. Quinæ citratis gr. iv.; syrupi simplicis fervefacti f℥j.; olei essentialis amygdalarum amarum guttas ii. Misce. Dosis, fluiddrachma bis vel ter die. *A very elegant preparation devised by the author. The flavour of the bitter almonds hides the bitter of the quinine.*

9. *Sulphate of Zinc Mixture and Pill.*

℞. Zinci sulphatis gr. vj.; acidi sulphurici diluti ♏xxx.; syrupi aurantii f℥ß.; infusi aurantii f℥vß. Misce, sumantur cochlearia duo ter die.

℞. Zinci sulphatis gr. xij.; extracti anthemidis ʒß. Misce, et divide in pilulas xij.: quarum sumatur una vel duæ ter die.

10. *Ammoniated Iron.*

℞. Ferri ammonio-chloridi gr. xx.; tincturæ zinziberis fʒij.; ammoniæ sesquicarbonatis ℈j.; syrupi f℥ß.; aquæ destillatæ f℥vß. Misce. Dosis, f℥j. ter die. *In debility, with acidity and flatulence.*

11. *Citrate of Iron with Ammonia.*

℞. Ferri citratis ʒſs.; ammoniæ sesquicarbonatis ʒſs.; tincturæ cardamomi compositæ, syrupi, singulorum fʒiij. Misce. Dosis, pars sexta ter die. *In debility, with acidity and flatulence.*

12. *Citrate of Iron for Children.*

℞. Ferri citratis gr. xij.; syrupi fʒiij.; aquæ destillatæ f℥iij. Misce. Dosis, f℥ſs. ter die.

13. *Chalybeate Mixtures.*

℞. Tincturæ ferri sesquichloridi fʒij.; syrupi zinziberis ℥j.; aquæ f℥vij. Misce. Sumantur cochlearia duo magna bis die.

℞. Vini ferri fʒvj.; tincturæ ferri sesquichloridi ♏xx.; aquæ destillatæ f℥vj. Misce. Sumantur cochlearia duo bis vel ter die.

14. *Steel and Acid Mixture.*

℞. Ferri sulphatis gr. xij.; acidi sulphurici diluti fʒj.; tincturæ cardamomi compositæ f℥ſs.; infusi rosæ compositi f℥vſs. Misce; sumantur cochlearia duo magna bis vel ter die.

15. *Steel and Bitters.*

℞. Infusi quassiæ f℥ſs.; tincturæ ferri ammoniati fʒſs.; ammoniæ sesquicarbonatis gr. vj.; syrupi aurantii fʒj.; aquæ destillatæ fʒvij. Misce; fiat haustus, bis vel ter quotidie sumendus. *For hysterical women.* (*Brodie.*)

16. *Sulphate of Iron for Children.*

℞. Ferri sulphatis gr. vj.; acidi sulphurici diluti ♏xij.; syrupi zinziberis fʒiij; aquæ florum aurantii fʒiij.; aquæ destillatæ f℥ijſs. Misce. Dosis, f℥ſs. ter die.

17. *Syrup of Iodide of Iron.*

Take 200 *grains of iodine;* 100 *grains of clean, fine iron wire, and six fluid ounces of distilled water; heat them gradually together till the iodine and iron have combined, and then boil briskly for a short time. Filter the boiling solution quickly into a glass vessel containing four ounces and a half of sugar, heat in a water bath till the sugar is dissolved, and add distilled water enough to make up* f℥vj. *Dose from* ♏x. *to* xx. *in syrup and water. See the Edinburgh Pharmacopœia.*

18. *Mistura Ferri Aromatica, or Heberden's Ink.*

℞. Corticis cinchonæ lancifoliæ contusi ℥j.; caryophyllorum contusorum ʒij.; ferri ramentorum ℥ſs.; aquæ menthæ piperitæ f℥xv.; macera per dies tres in vase clauso, subinde agitans, dein cola, et adde tincturæ cardamomi compositæ f℥iij.; tincturæ aurantii fʒiij. Dosis, f℥j.—iij. bis vel ter die. *A most agreeable aromatic tonic. The Dublin Pharmacopœia, from which this formula is taken, orders* ʒiij. *of sliced calumba root with the bark: but the preparation is less nauseous without it.*

19. *Mistura Ferri composita.*

℞. Myrrhæ contritæ ʒj.; potassæ carbonatis ʒſs.; aquæ rosæ f℥ix.; ferri sulphatis gr. xxv.; spiritus myristicæ f℥ſs.; sacchari ʒiv. First dissolve the sulphate in two ounces of rose water, and put it into the bottle; then rub the other ingredients smoothly together, and add them. Dose, f℥j.—iss. thrice daily.

20. *Steel with Aloes.*

℞. Ferri sulphatis ℈j.; sodæ subcarbonatis gr. xxv.; ammoniæ sesquicarbonatis ℈j.; vini aloes f℥ſs.; spiritûs myristicæ fʒiij.; aquæ destillatæ f℥vij. Misce. Dosis, f℥ſs. ter die.

℞. Misturæ ferri compositæ, decocti aloes compositi partes equales. Dosis, f℥j. ter die.

℞. Extracti aloes purificati gr. vj.; ferri sulphatis gr. xij.; extracti glycyrrhizæ gr. xij. Misce et divide in pilulas xij.; quarum sumatur una bis die, ante cibum.

21. *Nux Vomica, and Strychnia.*

℞. Tincturæ nucis vomicæ (*Pharm. Dub.*) fʒj.; acidi nitromuriatici diluti fʒj.; tincturæ zinziberis fʒij.; syrupi fʒiij.; aquæ f℥vſs. Misce. Dosis, pars sexta ter die.

℞. Strychniæ gr. j.; acidi nitrici diluti fʒj.; aquæ destillatæ f℥xij. Misce; sumatur f℥j. ter die. *In obstinate Debility, Diabetes insipidus, the Phosphatic diathesis, &c.* (*Dr. Golding Bird.*)

℞. Extracti nucis vomicæ (*Pharm. Dub.*) gr. ij.; extracti anthemidis ℈j. Misce, et divide in pilulas viij.; quarum sumatur una ter die.

22. *Dilute Nitromuriatic Acid.*

℞. Acidi nitrici fortissimi fʒj.; acidi hydrochlorici fʒij. Misce et adde, aquæ destillatæ fʒxv. Dosis, ♏x—xxx. ex aqua.

R. Acidi nitromuriatici diluti fʒij.; spiritus ætheris nitrici fʒij.; syrupi f℥ſs.; aquæ f℥vijſs. Misce. Sumatur pars sexta ter die. *In Dyspepsia, with nasty tongue, and inactive liver.*

(*With a dose of this it is often useful to give a pill containing a grain of sulphate of zinc with a little bitter extract.*)

R. Acidi nitromuriatici diluti fʒij.; infusi chirettæ f℥vijſs. Misce. Dosis f℥iſs. ter die. *A bitter that is very grateful to irritable bowels.*

23. *Dilute Nitromuriatic Acid with Orange Peel.*

R. Acidi nitrici diluti, acidi muriatici diluti aa fʒijſs.; syrupi aurantii f℥j.; aquæ florum aurantii f℥j.; aquæ destillatæ f℥xiijſs. Misce; sumatur cyathus vinarius ter vel quater die. (*Brodie.*)

24. *Sulphuric Acid Mixture.*

R Acidi sulphurici diluti fʒj.; syrupi aurantii fʒvj.; aquæ f℥vijſs. Misce. Sumatur pars sexta ter die. *A grateful refrigerant and tonic in Debility with profuse perspiration, in hot weather, &c.*

25. *Sulphuric Acid and Æther.*

R. Acidi sulphurici diluti ♏xl.; spiritûs ætheris sulphurici compositi fʒij.; sacchari albi ℥ſs.; aquæ menthæ viridis f℥vj. Misce. Sumatur pars quarta, quater die. *An admirable restorative after illness.*

26. *Stimulating Mixtures.*

R. Ætheris chlorici fʒj.; pulveris acaciæ ʒſs.; aquæ f℥iv. Misce. Dosis, pars tertia subinde.

R. Olei cajuputi (vel olei rutæ) ♏x.: pulveris acaciæ ʒſs.; syrupi fʒij.; tincturæ lavandulæ compositæ fʒij.; aquæ f℥iijſs. Misce. Dosis, pars tertia subinde.

R. Spiritus ammoniæ aromatici fʒiſs.; spiritus ætheris sulphurici fʒj.; syrupi zinziberis fʒiij.; aquæ anethi f℥iijſs. Misce. Dosis, pars tertia, subinde. *In syncope, hysteria, tympanites, &c.*

27. *Mistura quatuor Aromatum Vinosa, vulgo, Negus.*

R. Cinnamomi, zinziberis, myristicæ, caryophillorum singulorum contusorum ℈j.; sacchari albi ℥j.; vini Hispanici, vel Lusitanici generosi, aquæ ferventis aa f℥vj. Calefac simul in vase idoneo, super ignem, donec ebullitio incipisse videbitur, dein cola. Dosis f℥ij. *In syncope, sinking, rigors, and other cases, where it is desirable to produce powerful stimulation.*

28. *Strong Camphor Mixture.*

R. Camphoræ gr. xxv.; amygdalas dulces decorticatas sex; sacchari purificati ʒiij.; optime contere, dein adde gradatim, aquæ menthæ

viridis f℥vijß., ut fiat mistura, cujus sumantur cochlearia tria magna quartà quàque horâ. (*Hooper.*) *In Hysteric, and various Nervous and Spasmodic affections.*

29. *Tincture of Indian Hemp.*

℞. Resinæ cannabis Indicæ ʒj.; spiritus rectificati fʒxx. macera per dies quatuordecim et cola.

℞. Tincturæ supra-prescriptæ ♏xv.; mucilaginis acaciæ, fʒij.; tere et adde aquæ fʒvj.; ut fiat haustus.

30. *Compound Soothing Pills.*

℞. Pulveris ipecacuanhæ compositæ, extracti conii, singulorum ʒj.; misce, et divide in pilulas xxiv.; quarum sumantur una vel duæ subinde. *In painful ulcers, chronic rheumatism, stricture, &c.*

℞. Extracti hyoscyami, extracti conii, extracti papaveris, singulorum ℈j. Misce, et divide in pilulas xij. *In similar cases.*

31. *Pulvis Sudorificus Salinus.*

℞. Pulveris ipecacuanhæ compositi grana quindecim; potassæ nitratis grana quindecim; potassæ bicarbonatis grana quinque. Misce, fiat pulvis horâ somni sumendus, è cyatho ptisanæ.*

32. *Compound Opiate Mixtures.*

℞. Liquoris opii sedativi ♏xx.; spiritus ammoniæ aromatici, spiritus ætheris nitrici, singulorum fʒiß.; syrupi fʒij.; misturæ camphoræ f℥vß. Misce. Dosis, pars quarta, quartis horis.

℞. Morphiæ hydrochloratis granum; acidi hydrochlorici diluti guttas duas; aquæ f℥viiß.; syrupi zinziberis f℥ß. Misce. Dosis, pars octava.

℞. Syrupi papaveris fʒiv.; magnesiæ carbonatis ʒß.; spiritus ætheris nitrici; tincturæ hyoscyami, singulorum fʒij.; misturæ camphoræ f℥vij. Misce. Dosis, pars sexta subinde. *To tranquillize the*

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* We offer this as a substitute for the original *Pulvis Doveri*, the recipe for which is as follows:—"Take opium an ounce, saltpetre and tartar vitriolated each four ounces, ipecacuanha one ounce, liquorice one ounce. Put the saltpetre and tartar into a red-hot mortar, stirring them with a spoon till they have done flaming: then powder them very fine: then slice in your opium, grind these to a powder, and mix the other powders with these. Dose from 40 to 60 or 70 grains in a glass of white wine posset, going to bed: covering up warm, and drinking a quart or three pints of the posset-drink while sweating." Dr. Dover accounts for the largeness of the dose by saying, that the properties of the opium are mitigated by the other ingredients; but in the present day, four, six, or seven grains of opium would be a dangerous dose, spite of the other ingredients.—See "The Ancient Physician's Legacy to his Country," by Thomas Dover, M.B. Fifth edition. 1733.

system after injuries, operations, accouchements, hæmorrhage, violent mental excitement, &c.

§ II. Aperients.

33. *Black Draughts.*

℞. Sennæ foliorum ʒvj.; zinziberis concisi ʒß.; extracti glycyrrhizæ ʒij.; aquæ ferventis f℥ix. Post horas tres cola, et adde spiritûs ammoniæ aromatici fʒij.; tincturæ sennæ, tincturæ cardamomi compositæ aa f℥ß. Dosis f℥jß.*

34. *Red Draught.*

℞. Magnesiæ sulphatis ʒij—iv.; syrupi zinziberis, tincturæ cardamomi compositæ, singulorum fʒj; infusi rosæ compositi fʒx. Misce.

35. *Haustus Magnesiæ Sulphatis Acidus.*

℞. Magnesiæ sulphatis ʒj.—ʒiv.; syrupi aurantii fʒij.; acidi sulphurici diluti ♏x.; aquæ f℥j. Misce, fiat haustus. *To this draught may be added, one grain of sulphate of zinc, or of sulphate of iron, or two grains of quinine, in cases of debility.*

36. *Haustus Magnesiæ Albus.*

℞. Magnesiæ sulphatis ʒij.; magnesiæ carbonatis ℈j.; syrupi zinziberis fʒj.; aquæ anethi fʒxj. Misce, fiat haustus. *This draught will often be retained by the stomach when almost every other is rejected.*

37. *Cordial Aperient Draughts.*

℞. Pulveris rhei, potassæ sulphatis aa ℈j.; decocti aloes compositi aquæ menthæ piperitæ aa fʒvi.; spiritus ammoniæ compositi fʒß. Misce, fiat haustus.

℞. Pulveris rhei, bismuthi trisnitratis, confectionis aromaticæ, aa ℈ij.; aquæ menthæ piperitæ f℥iv.; Misce. Sumatur pars quarta bis die. *In habitual constipation and flatulence.*

38. *Rhubarb Draughts and Powders.*

℞. Pulveris rhei gr. x.; magnesiæ ustæ gr. v.; pulveris zinziberis gr. ij. Misce, fiat pulvis, omni mane sumendus.

℞. Rhei ℈j.; sodæ sesquicarbonatis ℈ß.; spiritus lavendulæ compositi fʒß.; aquæ pimentæ fʒx. Misce.

℞. Rhei gr. xv.; magnesiæ carbonatis ℈ß.; spiritus ammoniæ aromatici fʒß.; syrupi fʒj.; aquæ anethi fʒx. Misce.

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* This draught is greatly improved, both in flavour and efficacy, by the addition of a few caraway seeds, one ounce of buckthorn juice, one of tincture of jalap, and six of moist sugar.

39. *Saline Aperient Draughts.*

℞. Sodæ potassio-tartratis ʒiv. ; syrupi zinziberis fʒj. ; spiritûs myristicæ fʒſs. ; aquæ f℥ij. Misce, fiat haustus.

℞. Sodæ potassio-tartratis ʒij. ; sodæ sesquicarbonatis ℈j. ; sacchari albi ʒj. ; fiat pulvis, e cyatho aquæ sumendus, cum cochleari magno succi limonis, vel cum acidi citrici granis quindecim.

40. *Epsom Salts and Tartar Emetic.*

℞. Magnesiæ sulphatis ℥j. ; antimonii tartarizati gr. j. : aquæ menthæ f℥x. Misce ; sumantur cochlearia magna tria, quartâ quâque horâ. *An active nauseating aperient, fit for robust persons.*

41. *Saline Aperients with Tonics.*

℞. Magnesiæ sulphatis ʒiv; ferri sulphatis gr. viii.; quinæ disulphatis gr. xii. ; acidi sulphurici diluti fʒiſs. ; syrupi zinziberis f℥j.; tincturæ ejusdem fʒij. aquæ f℥viij. Misce. Dosis, pars octava bis die.

℞. Magnesiæ sulphatis ʒj. ; acidi sulphurici diluti fʒj. ; ferri sulphatis gr. xv.; infusi gentianæ compositæ f℥iij. ; tincturæ aurantii fʒiv.; infusi rosæ f℥vj. Misce. Dosis, pars sexta bis quotidie.

℞. Ferri potassio-tartratis ʒij.; sodæ potassio-tartratis ʒvj. Misce; fiant pulveres sex. Sumatur una mane, ex cyatho aquæ. *Combinations of saline purgatives with tonics, so as to answer the double purpose of draining congested abdominal veins, and bracing the system, are of great efficacy in most chronic complaints. The second of these formulæ is a prescription of Dr. Jephson's, who is famous for such combinations.*

42. *Pulvis e quatuor Salibus.*

℞. Sodii chloridi, sodæ sulphatis, magnesiæ sulphatis, potassæ sulphatis, singulorum partes æquales. Optime misceantur, et desiccentur ante ignem. Dosis ʒj—iv., ex cyatho aquæ. *An agreeable saline aperient. A grain of sulphate of iron may be added to each dose ; with sugar, or ginger, if agreeable.*

43. *Hospital House Physic.*

℞. Magnesiæ sulphatis ℥ij. ; pulveris rhei, jalapæ aa ʒj. ; aquæ menthæ piperitæ f℥vij. Misce. Dosis, pars sexta.

44. *Acetum Purgans.*

℞. Potassæ bitartratis ℥ſs. ; foliorum sennæ ʒiij. ; cinnamomi seminum anisi aa ʒiſs. aceti lbj. Post sufficientem infusionem, cola, et serva. Dosis f℥j. *Geiger, Pharm. Univ.*

45. *Castor Oil and Turpentine Draught.*

℞. Olei terebinthinæ, olei ricini aa fʒvj.; tincturæ sennæ fʒij. mucilaginis acaciæ fʒij.; aquæ menthæ quantum satis sit ut fiat haustus.

46. *Aperient Electuaries.*

℞. Pulveris potassæ supertartratis ℥ß.; sulphuris præcipitati ʒij.—iv.; confectionis sennæ ℥j.; syrupi zinziberis, quantum satis sit.

℞. Magnesiæ ustæ, potassæ supertartratis, pulveris rhei, aa ʒj.; pulveris zinziberis ʒß.; theriacæ, quantum satis est.

℞. Mannæ, confectionis sennæ, aa ℥j.; sulphuris ʒiij.; syrupi quantum satis sit. Dosis ʒj.—iv., omni nocte horâ somni.

47. *Pilulæ Catharticæ.*

℞. Aloes ℥ß.; pulveris colocynthidis, cambogiæ aa ʒj.; jalapæ ʒij.; saponis ʒj.; antimonii tartarizati ℈ß.; olei caryophillorum ♏xx.; contunde simul, et divide in pilulas, pondere granorum quinque.

48. *Pilulæ Catharticæ cum Calomelane.*

℞. Pilulæ præcedentis ʒiv.; calomelanos ʒj. Misce et divide in pilulas lx.

49. *Blue Pill and Colocynth.*

℞. Pilulæ hydrargyri ℈j.; extracti colocynthidis compositi ℈ij. Misce, fiant pilulæ duodecim.

50. *Sulphate of Iron with Aloes.*

℞. Ferri sulphatis, aloes Barbadensis aa ʒij.; pulveris rhei ʒj. Misce, et divide in pilulas lx. Dosis, una vel duæ horâ somni. *An admirable aperient for weak constipated persons.**

51. *Pilulæ Aloes Dilutæ.*

℞. Extracti aquosi aloes Barbadensis, saponis, theriacæ, extracti glycyrrhizæ aa ʒj. Solve leni calore in balneo; dein divide in pilulas xlviij. Dosis, una horâ somni. *A capital eccoprotic aperient, unloading the colon of scybala, but rather irritating to the rectum. The aloes should be of the best Barbadoes kind, purified by solution in water. The formula is attributed to Dr. Marshall Hall.*

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* When the common dose of an aperient does not act, it should be combined with a depressant such as antimony or ipecacuanha, if the patient is of an inflammatory habit, and with a tonic if there is a want of vigour in the system.

52. *Ipecacuanha and Rhubarb Pills.*

℞. Pulveris ipecacuanhæ gr. xxiv.; pulveris rhei ℈iv.; saponis ℈ſs. Misce, et divide in pilulas xxiv.; quarum sumatur una ter die. *A gentle aperient in piles and other congested conditions of the intestines.*

℞. Ipecacuanhæ gr. vj.; extracti aloes purificati gr. vj.; extracti rhei gr. xxxvj.; olei cajuputi ♏iv. Misce, et divide in pilulas xij.; sumatur una, horâ ante prandium.

53. *Pills of Aloes and Sulphuric Acid.*

℞. Aloes Barbadensis gr. xxiv.; acidi sulphurici fortissimi guttas vj. Misce, et divide in pilulas vj.; quarum sumantur duo, quartâ quâque horâ. *A very powerful aperient, that often succeeds when almost everything else fails. The author is indebted for the prescription to his friend Dr. Dickson.*

54. *Guaiacum and Jalap Pills.*

℞. Guaiaci pulveris, extracti jalapæ, extracti hyoscyami, aa ℈j.; cambogiæ gr. iij. Misce et divide in pilulas duodecim; quarum sumantur una vel duæ horâ somni. *An active purge, not irritating to the rectum.*

55. *Gingerbread Electuary.*

℞. Guaiaci pulveris ʒij.; sulphuris, rhei, aa ʒj.; zinziberis ʒj.; *Treacle* quantum satis sit ut fiat electuarium. Dosis, pars sexta.

56. *Guaiacum Electuaries.*

℞. Pulveris guaiaci gr. v.; pulveris cinchonæ ℈j.; pulveris cinnamomi compositi ℈ſs. Misce, fiat pulvis bis die sumendus.

℞. Pulveris guaiaci ʒij.; pulveris rhei ʒſs.; sulphuris ʒj.; pulveris myristicæ ʒſs.; theriacæ quantum satis est ut fiat electuarium. Dosis, pars sexta omni nocte. *In chronic Rheumatic diseases. This is commonly called the Chelsea Pensioner.*

57. *Sulphate of Manganese.*

℞. Manganesii sulphatis ℈j.; magnesiæ sulphatis ʒij.; syrupi zinziberis fʒj.; aquæ f℥iſs. Misce, fiat haustus mane sumendus. *In Gouty cases, to produce a copious discharge of bile.*

℞. Manganesii sulphatis, pulveris rhei āā ℈j.; spiritus lavandulæ compositi fʒj.; aquæ f℥iſs. Misce, fiat haustus.

§ III. ALTERATIVE AND FEBRIFUGE MEDICINES.

58. *Saline Draughts.*

R. Potassæ nitratis ℈ij.; sodæ sesquicarbonatis ℈j.; vini antimonii fʒij.; syrupi croci, spiritûs ætheris nitrici aa fʒj.; aquæ f℥v. Misce. Dosis f℥jſs. quartâ quâque horâ.

R. Liquoris ammoniæ acetatis f℥ij.; Misturæ camphoræ f℥iv. Misce. Dosis f℥j. quartâ quâque horâ.

R. Potassæ bicarbonatis ℈iv.; syrupi zinziberis fʒij.; aquæ f℥viſs. Dosis f℥iſs. quartâ quâque horâ, cum f℥ſs. succi limonum recentis.

R. Ammoniæ sesquicarbonatis ℈ijſs.; spiritus ætheris nitrici f℥ſs.; tincturæ cardamomi compositæ f℥iſs.; aquæ f℥v. Misce. Dosis f℥jſs. quartâ quàque horâ, cum cochleari magno succi limonum, vel gr. xv. acidi citrici.

R. Potassæ nitratis gr. x.; sacchari ℈j. Misce, fiat pulvis, sumendus e cyatho vinario aquæ menthæ viridis. *Green mint water and nitre form a very agreeable mixture, and produce a pungent cooling sensation on the tongue and palate. But the salt should only be dissolved at the moment of administration, and the mint water should be quite cool. Attention to these trifles makes a great difference to a patient who is parched with fever.*

59. *Digitalis Draught, for Aneurism or Hectic.*

R. Tinct. digitalis ♏xv.; aceti destillati fʒj.; syrupi fʒj.; aquæ f℥jſs. Misce; fiat haustus ter die sumendus, ad duodecim vices.

60. *Borax.*

R. Sodæ biboratis ʒj.; sodæ sesquicarbonatis ʒſs.; potassæ nitratis ʒſs. Misce, et divide in pulveres sex; quorum sumatur unus ter die e cyatho aquæ. *In lithic deposits.*

61. *Phosphate of Soda.*

R. Sodæ phosphatis ʒiij. Fiat pulvis, mane sumendus e cyatho aquæ. *As an aperient when the urine is red.*

R. Sodæ phosphatis ℈j.; infusi gentianæ compositi f℥j. Misce fiat haustus bis die sumendus.

62. *Calomel and Opium Pill.*

R. Calomelanos gr. i.—ii.; pulveris opii gr. ¼—½; extracti glycyrrhizæ quantum sufficit ut fiat pilula, quartis—sextis horis sumenda.

Calomel and Opium, with Antimony.

℞. Calomelanos i.—ii.; pulveris opii gr. $\frac{1}{4}$—$\frac{1}{2}$; antimonii tartarizati gr. $\frac{1}{6}$; extracti glycyrrhizæ quantum satis sit ut fiat pilula.

63. *Alterative Pill.*

℞. Pilulæ hydrargyri gr. iij.; extracti hyoscyami (*vel* pulveris Doveri) gr. iij.; pulveris ipecacuanhæ gr. j. Misce, fiant pilulæ duæ omni nocte sumendæ.

℞. Calomelanos gr. iv.; extracti colchici acetici gr. xij.; extracti colocynthidis compositi gr. xxiv.; extracti hyoscyami gr. xxiv. Misce, fiant pilulæ duodecim, quarum sumat unam vel duas horâ somni.

64. *Alterative Powder.*

℞. Hydrargyri cum creta gr. iij.—vi.; pulveris Doveri gr. j.—v. Sodæ sesquicarbonatis, sacchari albi aa ℈j. Misce, fiat pulvis omni nocte sumendus.

65. *Alterative Powder.*

℞. Hydrargyri cum creta gr. ij.; pulveris rhei gr. v. Sacchari ℈ſs.; pulveris cinnamomi gr. v. Misce, fiat pulvis, omni nocte sumendus.

66. *Plummer's Pill.*

℞. Sulphureti aurati antimonii, calomel aa ʒij. tere simul donec bene misceantur, dein adde pulveris resinæ guaiaci ʒiv.;* balsami copaibæ q. s. ut fiat massa pilularis ex cujus singulis drachmis formentur pilulæ xij. *Abridged from Dr. Andrew Plummer's original paper in the "Medical Essays and Observations published by a Society in Edinburgh," vol. i., 1747. Dr. Plummer was professor of medicine in the University of Edinburgh at that time.*

67. *Tartar Emetic with Mercury.*

℞. Antimonii potassio-tartratis gr. j.; hydrargyri cum creta gr. viij.; extracti conii gr. xvj. Misce, et divide in pilulas octo; quarum sumatur una bis vel ter die.

68. *Tartar Emetic Mixtures.*

℞. Antimonii potassio-tartratis gr. j.—ij.; syrupi papaveris f℥ſs.; aquæ destillatæ f℥vijſs. Misce; sumantur cochlearia duo magna ter die.†

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* In the original, gummi guaiaci ʒiij.; resinæ guaiaci ʒj.

† The inventor of the contrastimulant method of administering tartar emetic was Thomas Marryat, born 1730, died 1792; practised at Bristol; a very eccentric person: author of "Therapeutics, or the Art of Healing," a work which passed through many editions, and was very popular with apothecaries at the beginning of the present century. The twenty-fourth edition was published in

℞. Antimonii potassio-tartraris gr. iij.; tincturæ opii fʒſs.; aquæ f℥vj. Misce. Dosis, cochleare unum omni semihorâ, vel majori intervallo donec delirium cessaverit. *In Delirium Tremens and other cases of nervous excitement in which depletion is inadmissible.—See Dr. Graves's Clinical Medicine.*

69. *Colchicum Draughts.*

℞. Vini radicis colchici fʒſs ; syrupi fʒß; aquæ f℥i. Misce, fiat haustus quartis—sextis horis sumendus.

70. *Colchicum and Magnesia.*

℞. Vini colchici fʒij.; solutionis magnesiæ* f℥jſs.; syrupi croci fʒij.; misturæ camphoræ f℥ivß. Misce; sumantur cochlearia duo quartâ quâque horâ.

℞. Magnesiæ carbonatis, sodæ sesquicarbonatis aa ℈ß.; vini seminum colchici ♏xv.; aquæ pimentæ f℥jß. Misce, fiat haustus ter die sumendus.

71. *White Purgative Draught with Colchicum.*

℞. Aceti colchici fʒj; magnesiæ sulphatis ʒij; magnesiæ carbonatis syrupi zinziberis fʒj; aquæ anethi fʒx. Misce.

72. *Antilithic Pill.*

℞. Extracti colchici acetici, hydrargyri cum creta aa gr. j.; extracti colocynthidis compositi gr. ij. Misce, fiat pilula omni nocte sumenda.

Sir A. Cooper's Prescription for Chronic Gout and Rheumatism.

℞. Potassæ bicarbonatis ʒß.; tincturæ aurantii fʒij.; decocti aloes compositi f℥viij. Misce; sumatur cyathus vinarius omni mane.

1816, by Sherwood. The author says, page 5, "any fever may soon be extinguished by the use of the following powders :—Take of tartarized antimony five grains; white sugar or nitre a drachm. Let them be well rubbed in a glass mortar, and be divided into six powders; one to be taken every three hours, notwithstanding the nausea the first may possibly occasion. If they bring on a diarrhœa they should still be continued, and it will soon cease. If these are taken (which is most commonly the case) without any manifest inconvenience, let there be seven grains in the next six powders, and in the next, ten. Here I beg leave to retract what I said in some former editions of this work: viz. that till sickness and vomiting was excited this noble medicine was not to be depended on. For I have seen many instances wherein a paper has been given every three hours (of which there have been ten grains in six powders), without the least sensible operation, either by sickness, stool, urine or sweat, and though the patients had been unremittingly delirious for more than a week with subsultus tendinum, and all the other appearances of hastening death, they have perfectly recovered without any other medical aid, a clyster every other day excepted."

* Made by Murray or Dinneford.

73. *Colchicum and Rhubarb.*

R. Infusi rhei fʒx.; vini colchici ♏xx.; potassæ bicarbonatis ℈j.; tincturæ cardamomi compositæ fʒj. Misce, fiat haustus horâ somni sumendus.

74. *Turpentine in small Alterative Doses.*

R. Mucilaginis f℥ß.; sodæ sesquicarbonatis ℈ß.; olei terebinthinæ ♏xv.—xl.; aquæ destillatæ f℥j. Misce, fiat haustus. *In Rheumatism, rheumatic Ophthalmia, Iritis, passive Hæmorrhage, &c.*

75. *Lead Draught.*

R. Plumbi acetatis gr. iij.; aceti destillati fʒij.; tinct. opii ♏j.—x.; syrupi rhæados fʒj.; aquæ destillatæ fʒvij. Misce; fiat haustus quartâ quâque horâ sumendus, ad sex vices. *In active Hæmorrhage.*

76. *Tonic Aperient and Antacid Powders.*

R. Sodæ carbonatis exsiccatæ gr. v.; pulveris calumbæ gr. x.; pulveris rhei, zinziberis, aa. gr. ij. Misce; fiat pulvis, quotidie ante prandium sumendus.

R. Ferri sesquioxydi ℈j.; sodæ sesquicarbonatis gr. iij.; pulveris rhei gr. iij. Misce, fiat pulvis, ter die sumendus.

R. Pulveris cinchonæ ℈j.; sodæ sesquicarbonatis gr. iij.; pulveris aromatici gr. v. Misce, fiat pulvis, ter die sumendus.

77. *Antacid and Carminative Mixtures.*

R. Magnesiæ carbonatis ℈j.; spiritûs ammoniæ aromatici fʒß.; syrupi aurantii fʒiij.; aquæ calcis, aquæ destillatæ aa f℥iij. Misce, sumantur cochlearia duo magna ter die. *After meals.*

R. Cretæ preparatæ ʒß.; liquoris calcis f℥iij.; aquæ anethi f℥iij. Misce, sumantur cochlearia duo magna ter die.

R. Potassæ bicarbonatis ℈j.; infusi rhei f℥ij.; syrupi zinziberis fʒij.; aquæ menthæ piperitæ f℥ij. Misce. Dosis f℥j. bis die.

The above prescriptions are intended for children with voracious appetites, red tongues, thirst, and loaded urine.

R. Infusi caryophylorum f℥viijß.; sodæ sesquicarbonatis ʒj.; spiritûs ammoniæ aromatici fʒij.; tincturæ cardamomi compositæ f℥ß. Misce. Dosis f℥jß. bis die.

R. Ammoniæ sesquicarbonatis, potassæ bicarbonatis aa ʒß.; aquæ destillatæ f℥viijß. Dosis f℥jß. bis die. *For adults labouring under Dyspepsia, acidity, and turbid urine. To be taken after breakfast and at bed-time.*

78. *Liquor Potassæ Mixtures.*

℞. Liquoris potassæ fʒiij.; syrupi fʒiij.; aquæ destillatæ f℥vij. Misce. Sumatur pars sexta ter die, post cibum.

℞. Liquoris potassæ; tincturæ gentianæ; syrupi zinziberis, spiritûs ætheris nitrici aa fʒiij.; aquæ destillatæ f℥viſs. Misce; sumatur pars sexta bis vel ter die.

79. *Bismuth Mixtures.*

℞. Bismuthi trisnitratis ʒj.; pulveris acaciæ ʒij.; sodæ sesquicarbonatis ℈j.; syrupi zinziberis fʒiv.; aquæ anethi f℥vijſs. Misce. Dosis f℥jſs. bis die. *To be taken an hour after breakfast and dinner in cases of Gastrodynia and Pyrosis, with disordered urine.*

℞. Bismuthi trisnitratis ʒj.; magnesiæ carbonatis ʒjſs.; pulveris acaciæ ʒij.; syrupi zinziberis, tincturæ cardamomi compositæ aa fʒiij. aquæ f℥viijſs. Misce. Dosis f℥jſs. bis die.

80. *Prussic Acid Mixtures.*

℞. Acidi hydrocyanici diluti (Pharm. Lond.) ♏iv.; potassæ bicarbonatis gr. x.; syrupi zinziberis fʒſs.; aquæ anethi f℥jſs. Misce, fiat haustus bis die sumendus. *This acid should always be sent out in single draughts; then an overdose cannot be taken. In cases of irritable acid stomach.*

℞. Acidi hydrocyanici diluti (Pharm. Lond.) ♏iv.; misturæ cretæ f℥jſs.; sodæ sesquicarbonatis gr. v. Misce, fiat haustus. *In the same class of cases, with irritable bowels.*

81. *Antilithic Powder.*

℞. Magnesiæ gr. vj.; potassæ bicarbonatis gr. xij.; potassæ tartratis gr. xv. Misce; fiat pulvis, omni vespere sumendus e cyatho parvo aquæ. (*Brodie.*)

82. *Sarsaparilla and Nitric Acid.*

℞. Decocti sarsæ compositi f℥iv.; acidi nitrici diluti ♏xx.—lx.; tincturæ hyoscyami fʒſs. Misce, fiat haustus ter die sumendus.

83. *Alkaline Infusion of Sarsaparilla.*

℞. Sarsaparillæ Jamaicensis radicis, concisæ et contusæ ℥ij.; radicis glycyrrhizæ concisæ ʒij.; liquoris potassæ ♏xl.—lx.; aquæ destillatæ ferventis f℥x.; tincturæ cardamomi compositæ f℥iij. Macera per horas viginti quatuor, et cola. Sumatur totum quotidie.

84. *Sarsaparilla and Lime Water.*

℞. Sarsaparillæ ℥ij.; glycyrrhizæ ʒij.; liquoris calcis f℥x. Macera per horas viginti quatuor, et cola. Sumatur totum indies.

85. *Sarsaparilla Soup.*

To three ounces of sarsaparilla, sliced, add three pints of water; let them simmer on a slow fire until reduced to two pints; take out the root, bruise it, and return it into the water with half a chicken, or half a pound of beef without fat; boil them for an hour slowly, and pour off the soup for use.—*Dr. Colles's Lectures*, vol. ii. p. 346.

86. *Corrosive Sublimate Pills.*

℞. Hydrargyri sublimati corrosivi, ammoniæ hydrochloratis aa gr. j.—ij.; aquæ destillatæ guttam; micæ panis quantum satis est, ut fiant pilulæ xij., quarum sumatur una ter die.

87. *Corrosive Sublimate and Bark for Children.*

℞. Hydrargyri sublimati corrosivi gr. j.; tincturæ cinchonæ (*vel* tincturæ rhei) ℥ij.; solve. Dosis fʒj. ter die ex aqua. *To be taken after meals.*

88. *Iodine Mixture.**

℞. Iodinii gr. ½; potassii iodidi gr. j.; aquæ destillatæ f℥vj.

Vel ℞. Tincturæ iodinii compositi (P. L.) ♏xx.; aquæ destillatæ f℥vj.

Vel ℞. Liquoris potassii iodidi compositi (P. L.) f℥ſs.; aquæ destillatæ f℥vſs. Misce. Sumatur totum indies divisis dosibus.

89. *Iodine Ointment.*

℞. Iodinii gr. vij.; potassii iodidi ℈ij.; adipis ℥j. Misce.

Iodine Paint

Is composed of iodine with half its weight of iodide of potassium rubbed together with enough spirits of wine to make it of the consistence of paint. *Used as a strong discutient for bubo, diseased joints, &c.*

90. *Iodine Lotion.*

℞. Liquoris potassii iodidi compositi f℥j.; aquæ destillatæ f℥x. Misce. *For Scrofulous Ulcers, Fistulæ, Ophthalmia, &c.*

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* These three formulæ are of the same strength. The dose of iodine may be gradually increased to gr. 4-5ths, or gr. i. daily.

91. *Rubefacient Solution of Iodine.*

℞. Iodinii ʒiv.; potassii iodidi ℥j.; aquæ destillatæ f℥vj. Misce. *To touch very indolent sores, the edges of the eyelids, ozæna, &c.*

92. *Caustic Solution of Iodine.*

℞. Iodinii, potassii iodidi aa ℥j. ; aquæ destillatæ f℥ij. Misce. *To destroy weak granulations, ragged edges of sores, &c.*

93. *Iodine Bath.*

Should contain, for children, half a grain of iodine to each quart of warm water; and, for adults, one drachm to twenty-five gallons. The body may be immersed ten minutes.*

94. *Iodide of Potassium with Bitters.*

℞. Potassii iodidi gr. xij. ; extracti gentianæ ℈ij. Misce, et divide in pilulas duodecim.

℞. Potassii iodidi ℈j. ; infusi gentianæ compositi f℥vss.; tincturæ aurantii fʒij. Misce. Dosis, pars sexta ter die.

95. *Iodide of Potassium with Alkali.*

℞. Potassii iodidi gr. xij.; potassæ bicarbonatis ʒj.; (*vel* liquoris potassæ fʒij.); syrupi f℥ſs.; aquæ f℥vſs. Misce. Dosis f℥j. bis die.

96. *Iodide of Potassium with Colchicum.*

℞. Potassii iodidi ℈j.; potassæ bicarbonatis ʒj.; vini colchici fʒiſs.; syrupi fʒij. ; mixturæ camphoræ f℥viiſs. Misce. Dosis, pars sexta, ter vel quater die.

97. *Arsenical Mixture.*

℞. Liquoris arsenicalis ♏xx.—xxx.; syrupi fʒiij. ; tincturæ cardamomi fʒiij. ; aquæ destillatæ f℥vſs. Misce. Dosis f℥j. ter die, statim post cibum.†

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* Vide Essays on the Effects of Iodine in scrofulous diseases, by Lugol; translated by O'Shaughnessy; London, 1831.

† Mr. Hunt, of Herne Bay, who has had probably greater experience in the use of arsenic than any other man living, gives the following rules for its administration. "It should never be given when there is any feverishness; never on an empty stomach; never in increasing doses, the largest dose ever required being ♏ v. of Fowler's solution three times a day. The first effect to be looked for is an itching or smarting of the conjunctiva, and swelling and puffiness of the lower eyelid; upon which the dose should be reduced to three minims. If the conjunctiva continues much inflamed, the dose should be again reduced; but

§ IV. Emetics.

98. *Lowering Emetics.*

℞. Antimonii tartarizati gr. iij.; aquæ destillatæ f℥iij. Misce, sumatur cochleare magnum frequenter, donec vomitus supervenerit.

℞. Antimonii tartarizati gr. j.; ipecacuanhæ ℈j. Misce, fiat pulvis.

99. *Warm Emetics.*

℞. Pulveris ipecacuanhæ, ammoniæ sesquicarbonatis aa ℈j.; spiritûs lavandulæ compositi ♏x.; aquæ f℥j. Misce, fiat haustus. Bibat æger postea infusi anthemidis tepidi octarium. *In the incipient stage of Erysipelas, Fever, &c.*

℞. Farinæ sinapeos vulgaris cochleare magnum; salis vulgaris cochleare; aquæ tepidæ octarium. Misce.

100. *Zinc Emetic.*

℞. Zinci sulphatis ℈ij.; aquæ f℥ij. Misce, fiat haustus.

§ V. Enemata.

101. *Opiate Enema.*

℞. Decocti amyli f℥iv.; tincturæ opii fʒſs—ʒj. Misce. (*Pharm. Lond.*)

Opiate Suppository.

℞. Pulveris opii gr. j.—iv.; saponis (vel cetacei) gr. x.; contunde simul.

102. *Turpentine Enema.*

℞. Olei terebinthinæ f℥j.; vitelli ovi (*vel* mucilaginis acaciæ) quantum satis sit; tere simul et adde, decocti hordei, *vel* decocti avenæ, f℥xix.

103. *Tobacco Enema.*

℞. Tabaci foliorum ʒſs.; aquæ octarium dimidium; macera per horæ quartam partem, et cola.

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it should be kept in a tender state throughout the course. The arsenical course should be continued for as many months after the disappearance of the skin disease, as it had existed years before." Vide papers by Mr. Hunt, in Lancet for 1846, and his Treatise on Diseases of the Skin, Lond. 1847.

104. *Castor Oil Enema.*

℞. Olei ricini f℥iij.; potassæ carbonatis gr. xv.; saponis ʒj.; aquæ ferventis octarium; tere simul donec bene misceantur.

105. *Purgative Enemata.*

℞. Magnesiæ sulphatis ℥ij.; decocti avenæ octarium. Misce.

℞. Salis vulgaris ℥j.; decocti anthemidis octarium. Misce.

℞. Fellis bovini inspissati ℥ſs.; saponis ʒj.; aquæ ferventis octarium.

℞. Extracti colocynthydis ʒj.; aquæ ferventis octarium.

106. *Enemata for destroying Ascarides.*

℞. Aloes, saponis aa ℈j.; aquæ octarium.

℞. Infusi quassiæ octarium; ferri sulphatis gr. v. Misce.

§ VI. GARGLES.

107. *Detergent Gargle.*

℞. Liquoris calcis chlorinatæ fʒiv.; mellis ℥j.; aquæ destillatæ f℥iij. Misce. *A tablespoonful to be mixed with a glass of warm brandy and water, and to be used as a gargle.*

108. *Cooling and Sialagogue Gargles.*

℞. Mellis, confectionis rosæ caninæ aa ʒij; aceti destillati f℥ſs.; acidi hydrochlorici ♏xxx.; aquæ rosæ f℥j.; aquæ puræ f℥vj. Misce.

℞. Potassæ nitratis ʒj.; infusi rosæ compositi f℥viij. Misce.

℞. Oxymellis f℥iii.; misturæ camphoræ f℥v. Misce.

℞. Boracis ʒj.; mellis ℥j; aquæ rosæ f℥j.; aquæ f℥vj. Misce.

109. *Astringent Gargles.*

℞. Aluminis ʒj.; acidi sulphurici diluti ♏xx.; tincturæ myrrhæ fʒij.; decocti chinchonæ f℥vj. Misce.

℞. Zinci sulphatis ʒſs.; acidi sulphurici diluti fʒſs.; aquæ f℥viii.

℞. Liquoris chloridi zinci (*Sir W. Burnett's Disinfecting Solution*) fʒſs.; aquæ f℥viij. Misce. *An admirable wash for the mouth when the membrane is flabby and the secretions offensive.*

110. *Stimulating Gargles.*

℞. Tincturæ capsici fʒij.; oxymellis f℥ſs.; aquæ f℥vijſs. Misce.

℞. Tincturæ pyrethri (F. 183) fʒiij.; aquæ f℥viij. Misce.

111. *Tannin Gargle.*

℞. *Tannin* ℈j.; *Brandy* f℥ſs.; misturæ camphoræ f℥vſs. Misce. *For salivation, spongy gums, relaxed throat, &c.*

112. *Corrosive Sublimate Gargle.*

℞. Hydrargyri sublimati corrosivi gr. ij.; acidi hydrochlorici ♏xx.; mellis ℥j.; aquæ destillatæ f℥vij. Misce.

113. *Creosote Gargle.*

℞. Creosoti guttas xx.; mucilaginis f℥ſs.; tere et adde, aquæ f℥viij.

§ VII. LOTIONS, INJECTIONS, AND COLLYRIA.

114. *Frigorific Mixture.*

℞. Sodii chloridi, potassæ nitratis, ammoniæ hydrochloratis, partes æquales; aquæ quantum satis sit ad solvendas. *To be put into a bladder.*

115. *Spirit Lotion.*

℞. Spiritûs vini rectificati f℥j.; aquæ f℥xv. Misce.

116. *Lead Lotion.*

℞. Liquoris plumbi diacetatis fʒj.; acidi acetici diluti, spiritûs rectificati aa f℥ſs.; aquæ f℥ix. Misce, fiat lotio.

117. *Zinc Lotion.*

℞. Zinci sulphatis ʒj.; aquæ octarium. Misce.

118. *Discutient Lotion.*

℞. Ammoniæ hydrochloratis ℥ſs.; acidi acetici diluti, spiritûs rectificati aa f℥ſs.; misturæ camphoræ f℥xv. Misce.

119. *Nitric Acid Lotion.*

℞. Rosæ petalorum ℈j.; aquæ ferventis f℥viij.; acidi nitrici diluti fʒijſs. Misce, et cola post horam.

120. *Opiate Lotion.*

℞. Pulveris opii ʒſs.; aquæ destillatæ ferventis f℥viij.; macera per horas duas, et cola.

121. *Poppy Lotion.*

℞. Extracti papaveris ʒij.; aquæ ferventis f℥iv. Misce.

122. *Conium Lotion.*

℞. Extracti conii ʒj.; aquæ destillatæ f℥iij.; tere simul, et macera per horas duas; dein cola.

123. *Belladonna Lotion.*

℞. Extracti belladonnæ ℈j.; aquæ f℥iv. Misce, et cola.

124. *Arsenical Lotion.*

℞. Liquoris arsenicalis fʒj.; aquæ destillatæ f℥j. Misce.

125. *Black Wash.*

℞. Calomelanos ʒj.; mucilaginis acaciæ f℥ſs.; liquoris calcis f℥vſs. Misce.

126. *Yellow Wash.*

℞. Hydrargyri sublimati corrosivi gr. vj.—xij.; liquoris calcis f℥vj. Misce.

127. *Chloride of Zinc Lotion.*

℞. Liquoris zinci chloridi (*Sir W. Burnett's*) fʒſs.; aquæ destillatæ f℥viij. Misce.

128. *Iron Lotion.*

℞. Ferri sulphatis gr. viij.; aquæ destillatæ f℥viij. Misce. See *Mr. Vincent's* "Observations."

129. *Alum Lotion.*

℞. Aluminis ʒſs.; aquæ destillatæ f℥viij. Misce.

130. *Blue Lotion.*

℞. Cupri sulphatis gr. viij.; aquæ f℥viij. Misce.

131. *Tannin Lotion.*

℞. Tannin ʒſs.; spiritus rectificati fʒj.; aquæ destillatæ f℥iv. Misce.

132. *Oakbark and Catechu Lotions.*

℞. Catechu ʒj.; aquæ ferventis f℥viij. Macera per horam et cola.

℞. Corticis quercus ℥ij.; aquæ ferventis octarium; coque ad consumptionem dimidii, et cola.

133. *Borax Lotion.*

℞. Boracis ʒj.; aquæ destillatæ f℥viij. Misce.

134. *Nitrate of Silver Injection for the Urethra.*

℞. Argenti nitratis gr. ij.; aquæ destillatæ f℥viij. Misce. (*Ricord.*)

135. *Sulphate of Zinc Injection.*

℞. Zinci sulphatis gr. viij.; aquæ destillatæ f℥viij. Misce.

136. *Acetate of Zinc Injection.*

℞. Zinci sulphatis gr. v.; liquoris plumbi diacetatis fʒſs.; aquæ rosæ f℥iv. Misce, fiat injectio.

137. *Acetate of Copper Injection.*

℞. Cupri sulphatis gr. v.; liquoris plumbi diacetatis fʒſs.; aquæ rosæ f℥iv. Misce, fiat injectio.

138. *Ammoniuret of Copper Injection.*

℞. Liquoris cupri ammonio-sulphatis ♏xx.; tincturæ opii fʒſs.; aquæ rosæ ℥iv. Misce, fiat lotio.

139. *Sulphate of Zinc with Opium.*

℞. Pulveris opii ℈ſs.; aquæ ferventis octarium dimidium; macera per horas duas, dein cola et adde zinci sulphatis ℈ſs.

140. *Collyria.*

℞. Zinci sulphatis gr. j.—iv.; *vel* aluminis gr. j.—iv.; *vel* cupri sulphatis gr. ½—ij.; *vel* argenti nitratis gr. j.; *vel* zinci acetatis gr. j.—iv.; *vel* liq. plumbi diacetatis ♏x.; aquæ destillatæ f℥j. Misce.

One part of good brandy to six of water makes an admirable collyrium for most cases.

141. *Corrosive Sublimate Collyrium.*

℞. Hydrargyri sublimati corrosivi gr. j.; aquæ destillatæ f℥viij. Misce. (*Mackenzie.*)

142. *Opiate Collyrium.*

℞. Zinci sulphatis gr. xij. (*vel* liquoris plumbi diacetatis fʒſs.); liquoris opii sedativi fʒij.; aquæ destillatæ f℥xij. Misce.

143. *Opodeldoch*, vel *Linimentum Saponis.*

℞. Spiritus vini rectificati libras iv.; saponis mollis libram unam; digere in leni calore donec fiat solutio, cui adde camphoræ uncias duas, olei rosmarini, origani aa semunciam. Misce, agitando.

144. *Stimulating Liniments.*

℞. Liquoris ammoniæ fʒij.; linimenti saponis (*vel* linimenti camphoræ compositi) f℥j. Misce, fiat linimentum.

℞. Tincturæ capsici f℥ſs.; linimenti saponis f℥iſs. Misce.

145. *Pearson's Liniment.*

℞. Olei olivæ f℥jſs.; olei terebinthinæ f℥ſs.; acidi sulphurici fortissimi fʒjſs. Misce gradatim.

146. *Chilblain Liniment.*

℞. Tincturæ cantharidis fʒiij.; linimenti saponis fʒix. Misce, fiat linimentum.

147. *Opiate Liniment.*

℞. Tincturæ opii f℥ſs.; linimenti saponis f℥j. Misce.

148. *Strychnia Liniment.*

℞. Strychniæ gr. iv.; spiritus rectificati f℥j. Applicetur ope penicilli.

149. *Aconitina Liniment.*

℞. Aconitinæ gr. iv.; spiritus rectificati f℥j. Applicetur ope penicilli.

150. *Mercurial Liniment.*

℞. Unguenti hydrargyri fortioris; adipis aa ℥iv.; camphoræ ℥j.; spiritus rectificati fʒj.; liquoris ammoniæ f℥iv. Misce.

151. *Croton Oil Embrocation.*

℞. Olei tiglii guttas xxx. linimenti saponis f℥j. Misce.

§ VIII. POULTICES.

152. *Bran Poultice.*

Make a linen or flannel bag of the size requisite to cover the part affected, and fill it loosely with bran. Pour boiling water on this till it is thoroughly moistened ; put it into a coarse towel and wring it dry ; then apply it, so soon as it is cool enough.

153. *Bread Poultice.*

"I shall now speak," says Mr. Abernethy, "of the bread and water poultice. The way in which I direct it to be made is the following:—Put half a pint of hot water into a pint basin, add to this as much of the crumb of bread as the water will cover ; then place a plate over the basin, and let it remain about ten minutes ; stir the bread about in the water, or, if necessary, chop it a little with the edge of the knife, and drain off the water by holding the knife on the top of the basin, but do not press the bread, as is usually done ; then take it out lightly, and spread it about one-third of an inch thick on some soft linen, and lay it upon the part."

A very admirable soft poultice for parts that are excoriated, or that threaten to slough from pressure, during long illnesses, may be made by mixing equal parts of bread crumbs and of mutton suet grated very fine, with a little boiling water, and stirring them in a saucepan over the fire till they are well incorporated.

154. *Linseed Meal Poultice.*

The highest authority on poultices was Mr. Abernethy, who seemed to revel in the idea of them. "Scald your basin," he says, "by pouring a little hot water into it, then put a small quantity of finely ground linseed meal into the basin, pour a little hot water on it, and stir it round briskly until you have well incorporated them ; add a little more meal and a little more water, then stir it again. Do not let any lumps remain in the basin, but stir the poultice well, and do not be sparing of your trouble. If properly made, it is so well worked together, that you might throw it up to the ceiling, and it would come down again without falling in pieces ; it is, in fact, like a pancake. What you do next, is to take as much of it out of the basin as you may require, lay it on a piece of soft linen, let it be about a quarter of an inch thick, and so wide that it may cover the whole of the inflamed part."

155. *Yeast Poultice.*

℞. Farinæ lb. j.; cerevisiæ fermenti f℥j. Misce, et calorem lenem adhibe donec intumescant. (Pharm. Lond.)

156. *Mustard Poultice.*

℞. Lini seminum, sinapis, singulorum contritorum libram dimidiam; aceti fervefacti, quantum satis sit; ut fiat cataplasmatis crassitudo. Misce. (Pharm. Lond.)

A far better poultice is made by merely mixing flour of mustard with warm (not boiling) water.

157. *Opiate Poultice.*

℞. Micæ panis, et *lotionis opiatæ* suprapræscriptæ (F. 120), singulorum, quantum satis sit.

158. *Conium Poultice.*

℞. Cataplasmatis panis quantum satis sit; extracti conii ʒj. Misce.

159. *Carrot Poultice.*

Boil carrots till they are quite soft, then mash them into a smooth pulp.

§ IX. OINTMENTS.

160. *Scott's Ointment.*

℞. Unguenti hydrargyri fortioris, cerati saponis aa ℥j.; camphoræ pulverizatæ ʒj. Misce.

161. *Tartar Emetic Ointment.*

℞. Antimonii potassio-tartratis ʒj.; adipis ℥j. Misce.

162. *Ointments for Piles.*

℞. Pulveris gallæ ʒj.; liquoris plumbi diacetatis ♏xv.; adipis ℥j. Misce.

℞. Pulveris opii ℈ss; liquoris plumbi diacetatis guttas x; adipis ℥ſs. Misce.

163. *Peruvian Balsam Ointment.*

℞ Balsami Peruviani ʒj.; unguenti cetacei ℥j. Misce.

164. *Chalk Ointment.*

R. Cretæ subtillissime pulverizatæ ℥j.; olei olivæ ʒiij.; adipis ℥ſs. Misce. *For Burns, excoriations with acrid discharge, &c.*

165. *Magnesia Ointment.*

R. Magnesiæ carbonatis ʒj.; adipis ℥j. Misce.

166. *Bismuth Ointment.*

R. Bismuthi trisnitratis ʒij.; adipis ʒvj. Misce. *A capital ointment for excoriations, and irritable sores.*

167. *Veratria Ointment.*

R. Veratriæ gr. iv: spiritus rectificati fʒj; adipis ʒj. Misce. *In Neuralgia. A bit the size of a bean to be rubbed on the painful part.*

168. *Ointments for the Eye-lids.**

R. Unguenti citrini (*hydrargyri nitratis*) ʒſs.; adipis f℥ſs. Solve leni calore.†

R. Unguenti citrini ʒſs.; hydrargyri nitrico-oxydi in pulverem subtilissimum redacti gr. v.; adipis ʒjv. Misce bene.

R. Liquoris plumbi diacetatis guttas x.; morphiæ acetatis gr. iv.; calomelanos gr. x.; adipis ℥ſs. Misce.

169. *Ointment of Nitrate of Silver.*

R. Argenti nitratis gr. iv.; adipis bene loti ʒſs. Misce.

170. *Calomel Ointment.*

R. Calomelanos ʒij.; adipis ʒvii. Misce. *In chancre, and condylamata, &c.*

171. *Verdigris Ointment.*

R. Calomelanos, cupri acetatis aa ʒj.; cerati resinæ ℥j. Misce. *For warts; indolent eruptions on the head, &c.*

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* *Singleton's Golden Ointment* for the eyelids is said to be composed of equal parts of orpiment and lard.

† The nitrate of mercury solidifies olive oil, and renders other oils green and rancid, so that it seems better to return to the old formula, and employ lard only, and not oil in the preparation of the *unguentum citrinum*. Mr. Wilde speaks highly of a *brown* ointment of nitrate of mercury, prepared by the Dublin chemists, some of whom use rape oil, others fish oil.

172. *Compound Lead Cerate.*

℞. Liquoris plumbi diacetatis fʒiij.; ceræ ℥iv.; olei olivæ octarium dimidium; camphoræ ʒß. Melt the wax and add gradually to it the oil, in which the camphor has been previously dissolved; as they cool, add the liquor plumbi, stirring continually till well mixed.

173. *Red Precipitate Ointment.*

℞. Hydrargyri nitrico-oxydi, optime pulverizati ʒj.; adipis ℥j. Misce.

§ X. MISCELLANEOUS PRESCRIPTIONS FOR VARIOUS SURGICAL DISEASES.

174. *Demulcent Mixtures for Gonorrhœa.*

℞. Pulveris acaciæ ʒij.; sodæ sesquicarbonatis ʒj.; tincturæ opii ♏xx.; aquæ f℥vijß. Misce. Dosis f℥jß. quater die.

℞. Liquoris potassæ fʒij,; liquoris opii sedativi fʒß.; misturæ amygdalæ f℥vj. Misce. Sumantur cochlearia duo quartâ quâque horâ.

℞. Liquoris potassæ; tincturæ hyoscyami aa fʒij.; aquæ f℥iv.; Misce. Sumatur pars quarta ter die.

175. *Copaiba Mixture.*

℞. Copaibæ fʒij.—iv.; mucilaginis acaciæ fʒiv.; spiritûs ætheris nitrici, spiritûs lavandulæ aa fʒij.; olei cinnamomi guttas vj.; aquæ f℥v. Misce. Dosis f℥j. ter die.

176. *Copaiba and Oil of Cubebs.*

℞. Copaibæ fʒiij.; olei cubebæ ♏xx.; liquoris potassæ fʒij.; sp. myristicæ fʒiij.; misturæ camphoræ f℥vij. Misce. Sumantur cochlearia duo magna ter die.

Copaiba and Kino.

℞. Copaibæ f℥ß.; pulveris kino ʒj.; mucilaginis acaciæ fʒiij.; spiritûs lavandulæ compositi fʒiij.; aquæ f℥v. Misce. Sumantur cochlearia duo magna ter die.

Copaiba and Catechu.

℞. Copaibæ f℥ß.; tincturæ catechu fʒvj.; olei juniperi guttas duas; mucilaginis fʒiij.; aquæ f℥v. Misce. Sumantur cochlearia duo ter die.

Turpentine and Copaiba.

℞. Olei terebinthinæ fʒij.; copaibæ fʒvj. Misce; sumantur guttæ quadraginta ter die, ex cyatho aquæ.

177. *Copaiba and Magnesia Pills.*

℞. Copaibæ f℥ß.; magnesiæ carbonatis quantum satis sit ut fiat massa in pilulas dividenda.

178. *Cubebs and Soda.*

℞. Pulveris cubebæ ℈ij.; sodæ sesquicarbonatis, potassæ bitartratis aa ℈ß. Misce; fiat pulvis, ter die sumendus.

179. *Cantharides and Zinc.*

℞. Zinci sulphatis gr. xxiv.; pulveris cantharidis gr. vj.; pulveris rhei ʒj.; terebinthinæ Venetiensis quantum satis sit, ut fiant pilulæ viginti quatuor, quarum sumantur duo ter die.

180. *Cantharides and Steel.*

℞. Tincturæ ferri sesquichloridi, tincturæ cantharidis aa fʒij.: tincturæ capsici fʒj.; syrupi croci fʒij.; aquæ pimentæ f℥vj. Misce; sumantur cochlearia duo ter die.

181. *For Chronic Cystitis.*

℞. Foliorum buchu, et uvæ ursi aa ʒij.; aquæ ferventis f℥vj. Macera per horas duas; dein cola, et adde liquoris potassæ fʒj.; tincturæ cinnamoni, tincturæ hyoscyami aa fʒiij. Misce; sumantur cochlearia duo ter die.

℞. Pareiræ ℥j.; aquæ destillatæ octarium; decoque ad dimidium; dein adde decocti cinchonæ flavæ f℥vj.; tincturæ hyoscyami fʒiij.; sodæ sesquicarbonatis ʒiß. Dosis f℥iij. bis die.

℞. Decocti chimaphilæ f℥j.; syrupi zinziberis fʒj.; spiritus ætheris nitrici fʒj. Misce, fiat haustus bis in die sumendus.

182. *Benzoic Acid.*

℞. Acidi benzoici, ammoniæ sesquicarbonatis āā ʒj.; syrupi tolutani fʒij.; aquæ destillatæ f℥vj. Misce. Dosis f℥j. ter die.

℞. Acidi benzoici, extracti papaveris āā ʒß. Misce, et divide in pilulas xij.; quarum sumantur duo ter die.

℞. Acidi benzoici, sacchari albi āā gr. viij. Fiat pulvis, ter die sumendus. *In Urinary disorders, chronic Bronchitis and Cystitis.*

183. *Antiodontalgic Remedies.*

℞. Mastiches ʒj.; spiritus rectificati (vel *Eau de Cologne*) ℥jſs. Solve. *Cotton imbued with this forms a good temporary plug for a carious tooth. The same purpose is answered by a solution of gum copal in æther; or by collodion, or by a solution of gutta percha in chloroform.* See Tomes's Lectures.

Ætherial Tincture of Tannin.

℞. *Tannin* ʒj.; mastiches ʒj.; spiritus ætheris sulphurici ℥jſs. Misce. *For the same purpose.*

Tincture of Pellitory.

℞. Radicis pyrethri concisi ℥ſs.; spiritus rectificati ℥iv. Macera per dies xiv., et cola. *Half a teaspoonful mixed with a wine glassful of water, forms a very agreeable wash in nervous and atonic toothache.*

184. *Eye Snuff.*

℞. Pulveris asari partes tres; pulveris florum lavandulæ partes duas. Misce. *Vel* ℞. Pulveris euphorbii partem unam, pulveris amyli partes septem. Misce.

Mercurial Eye Snuff.

℞. Hydrargyri sub-sulphatis flavi ʒiſs.; pulveris glycyrrhizæ ʒij. Misce intime.

185. *Schmucker's Resolvent Pills.*

℞. Sagapeni, galbani, saponis aa ʒj.; rhei ʒjſs.; antimonii potassio-tartratis gr. xv.; succi glycyrrhizæ ʒj. Misce. Dosis, gr. xv. bis die.

Richter's Pills.

℞. Ammoniaci, asafœtidæ, saponis, valerianæ, arnicæ aa ʒij.; antimonii potassio-tartratis gr. xviij.; syrupi quantum satis est ut fiat massa. Dosis, gr. xx.—xxx. ter die.

186. *Gallic Acid Mixture.*

℞. Acidi gallici ℈ij.; syrupi fʒij.; aquæ destillatæ f℥viij.;. Misce. Dosis, pars sexta, tertiâ vel quartâ quâque horâ. *In passive Hæmorrhage.*

187. *Alum Mixtures.*

℞. Aluminis ʒj.; acidi sulphurici diluti fʒiſs.; syrupi f℥ſs.; infusi rosæ f℥vijſs. Misce. Dosis, pars sexta quartâ quâque horâ. *In the same.*

℞. Aluminis ʒj.; lactis Oj.; corticis limonis ℈j.; coque per quartam partem horæ, et cola. *To be drunk cold, ad libitum.*

188. *Resinous Lotion.*

℞. Tincturæ benzoes compositæ fʒj.; aquæ f℥ij. Misce.

189. *Sir A. Cooper's Prescription for Cancer.*

℞. Ammoniæ sesquicarbonatis gr. v.; sodæ sesquicarbonatis ʒſs.; tincturæ calumbæ fʒj.; infusi gentianæ compositi f℥jſs. Misce, fiat haustus bis die sumendus.

190. *Arnica Montana.*

℞. Foliorum arnicæ ʒij.; aquæ ferventis Oſs.; macera per horam, et cola. Dosis ℥j.

℞. Florum arnicæ ℥jſs.; spiritûs rectificati Oj.; macera per dies xiv., et cola; vel

℞. Foliorum arnicæ ℥jſs.; spiritûs tenuioris Oj.; macera per dies xiv., et cola. Dose ♏xv.—xxx. *In nervous headache, atonic amaurosis, tinnitus aurium,* and as a local application for muscular stiffness after bruises. *Vide* Wilde's Contributions to Aural Surgery, Dublin, 1848.

191. *Phosphorus Pills.*

℞. Micæ panis ʒj; aquæ destillatæ quantum satis sit ut fiat massa idoneæ crassitudinis, dein adde phosphori granum unum. Misceantur bene et divide in pilulas xx. Dosis, una ter vel quater die. *In intense nervous debility.*

192. *To make a Metallic Amalgam or Cement, to fill Decayed Teeth.*

Rub together in a mortar some silver, reduced to a fine powder by filing or by precipitation, with a few globules of mercury. When well mixed into a paste, knead it well with the fingers, and squeeze out any superfluous mercury. Then the cavity of the tooth having been properly scraped out and dried, fill it with the amalgam, making the surface of the metal smooth, and even with that of the tooth. The patient must be desired not to use the teeth for some hours, till the amalgam has become hard.

193. *To melt Nitrate of Silver for the purpose of coating a Probe, or Sound.*

"Some powdered lunar caustic, from six to twenty grains, is to be moistened with water in a little porphyry dish, boiled up over a spirit lamp, and constantly stirred with a silver knife till the water have evaporated, and the caustic remain fluid in its water of crystallization alone, which may be ascertained by its thin pap-like appearance, and the formation of the crystallization-film. This paste is now to be spread with the spatula on the slightly heated groove of the caustic-holder, and, when it has cooled, any projection is to be removed with the spatula, or with pumice-stone. Whilst boiling, the caustic flies about smartly, and therefore it is necessary to put on a glove, so that the hand be not spotted with black."—*South's Chelius.*

194. *To make common Bougies.*

" A piece of fine linen, which has been already used, nine inches long and half an inch to an inch in width according to the thickness of the bougie to be made, is to be dipped into melted plaster, and when a little cooled, spread flat and even with a spatula; it is then to be rolled together between the fingers, and afterwards between two plates of marble till it is quite firm and smooth. The bougie must be equally thick throughout its whole length to about one inch from its point, from whence it should gradually taper, and terminate in a firm round point. Bougies are also made by dipping cotton-threads in melted wax till they have acquired sufficient size, after which they are rolled between marble plates."—*South's Chelius. This formula may be useful to surgeons on foreign stations.*

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THE END.

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TIGHT

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